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Hazardous Materials Technical Center

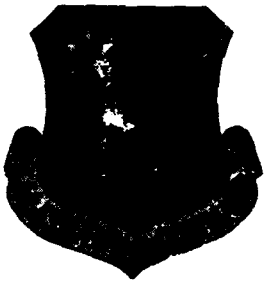
AD-A210 467

INSTALLATION RESTORATION PROGRAM

PRELIMINARY ASSESSMENT

BETHEL RADIO RELAY STATION, ALASKA

April 1989



Submitted to:

HQ AAC/DEPV
Elmendorf AFB, AK 99506

Submitted by:

Hazardous Materials Technical Center
The Dynamac Building
11140 Rockville Pike
Rockville, MD 20852

DYNAMAC
Operated for the Defense Logistics Agency by: CORPORATION
Corporate Headquarters The Dynamac Building 11140 Rockville Pike Rockville MD 20852 Tel 301-468-2500

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

FIGURES

TABLES

EXECUTIVE SUMMARY

A. Introduction

The Hazardous Materials Technical Center (HMTC) was retained in January 1988 to conduct the Installation Restoration Program (IRP) Preliminary Assessment of Bethel Radio Relay Station (RRS), Alaska, under Contract No. DLA-900-82-C-4426 with funds provided by the Alaskan Air Command (AAC).

Department of Defense (DoD) policy was directed by Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5 dated 11 December 1981, and implemented by Air Force message dated 21 January 1982, as a positive action to ensure compliance of Air Force installations with existing environmental regulations. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. DoD policy is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites on DoD facilities, control the migration of hazardous contamination from such facilities, and control hazards to health and welfare that may have resulted from these past operations.

To implement the DoD policy, a four-phased IRP has been directed consisting of:

- Preliminary Assessment (PA) - to identify past spill or disposal sites posing a potential and/or actual hazard to public health or the environment;
- Site Investigation/Remedial Investigation/Feasibility Study (SI/RI/FS) - to acquire data via field studies, for the confirmation and quantification of environmental contamination that may have an adverse impact on public health or the environment and to select a remedial action through preparation of a feasibility study;
- Research, Development and Demonstration (RD & D) - if needed, to develop new technology for accomplishment of remediation; and
- Remedial Design/Remedial Action (RD/RA) - to prepare designs and specifications and to implement site remedial action.

The Bethel RRS Preliminary Assessment included:

- an onsite visit, including interviews with three AAC personnel, conducted by HMTC personnel during 13 through 23 June 1988;
- the acquisition and analysis of pertinent information and records on hazardous material use and hazardous waste generation and disposal at the installation;
- the acquisition and analysis of available geological, hydrological, meteorological, and environmental data from pertinent Federal, State, and local agencies; and
- the identification of sites on the installation that are potentially contaminated with hazardous materials/hazardous wastes (HM/HW).

B. Major Findings

Past installation operations involved the use and disposal of materials and wastes that were subsequently categorized as hazardous. The major operations of the installation that used and disposed of HM/HW included radio relay, vehicle maintenance, and field maintenance. Waste oils, paints, thinners, vehicular maintenance fluids, and polychlorinated biphenyls (PCBs) were generated by these activities. The common practice at similar facilities was to bury these materials in a landfill, however, a landfill was not identified at Bethel RRS during the site visit. Asbestos, used as a construction material, was observed throughout a number of buildings at the RRS.

Interviews with AAC personnel, a review of installation records and a field survey resulted in the identification of nine disposal and/or spill sites at the installation that are potentially contaminated with HM/HW. These sites were assigned a Hazard Assessment Score (HAS) according to the U.S. Air Force Hazard Assessment Rating Methodology (HARM). The following is a summary of the findings for each of the identified sites.

Site No. 1 - POL Facility (HAS-56)

The Petroleum, Oils, and Lubricants (POL) facility consists of two empty concrete tank holders, a pump house, and piping to the Vehicle Maintenance facility. Stained soil and a petroleum odor were observed during the site visit. The stained areas were approximately 20 feet by 20 feet near the pumphouse and 10 feet by 20 feet in the concrete holders. Small stains were also found at the ends of the holders.

Site No. 2 - Vehicle Maintenance Building (HAS-59)

The Vehicle Maintenance facility consists of an abandoned building with several vehicles and a fuel pump. Within the building there were drums and cans of paints, thinners, alcohol, oils, and other vehicular fluids. Outside the building there was stained soil at various locations around the building's edge. Empty containers on the ground usually accompanied areas of stained soil. None of the stains was more than 3 feet in diameter. It is unknown whether the fuel pump was connected to an underground storage tank or was directly supplied by the POL facility.

Site No. 3 - 5-Gallon Cans under Antenna No. 1 (HAS-59)

Several 5-gallon cans were found under Antenna No. 1. The cans were on gravel and were leaking a black, sticky, thick substance. The surface area of the stain was confined to an area no larger than 3 feet around the cans.

Site No. 4 - 55-Gallon Drum on Equipment Building Porch (HAS-59)

A 55-gallon drum was found on the porch of the Equipment Building. The drum had leaked a slick, brown substance on the porch and onto the ground creating a stained area 20 feet by 30 feet long.

Site No. 5 - Drums, Cans, and Canisters at North End of Equipment Building (HAS-59)

At the north end of the Equipment Building, several drums filled with either a yellow or brown, thick, sticky substance were found. Unlabeled 5-gallon cans and fire extinguisher canisters were also found. The ground around the containers was heavily stained over an area approximtely 10 feet by 30 feet.

Site No. 6 - Horizontal 55-Gallon Drums (HAS-60)

At the entrance of the east unpaved road, twelve 55-gallon drums were found in a row. The drums were laying horizontally and had been gun shot, thus releasing their contents. The drums leaked either a black, thick sticky substance or a thin light colored substance that absorbed into the ground. The stained areas ranged in size from a few square feet to approximately 30 feet by 10 feet, downslope from the drums.

Site No. 7 - Dump Area along East Unpaved Road (HAS-60)

Approximately 100 yards along the east unpaved road on the right hand side, in the bushes, a dump area was located. The area contained 55-gallon and 5-gallon containers of paints, thinners, unidentified materials, and construction debris. Staining of the soil could not be determined due to the thick cover of foliage.

Site No. 8 - Permafrost Conductors (HAS-57)

On each support leg of all of the antennas is a permafrost conductor, which was used in conjunction with oil to test the permafrost for support integrity. The oil was poured into the leg and a conductor was used to measure the conductivity based on the permafrost location. During the site visit, oil stains were observed at each leg, which covered a one foot radius.

Site No. 9 - Disturbed Land (HAS-60)

Approximately 75 yards west of Antennas No. 1 and No. 2 was an area of disturbed ground approximately 20 feet by 20 feet. The soil was stained and there were signs of vegetative stress in this area.

C. Conclusions

Information obtained through six interviews and field observations indicates that HM/HW have been disposed of on the Bethel RRS property in the past at nine sites. Each of these sites is potentially contaminted with HM/HW and exhibit the potential for contaminant migration to groundwater and surface water.

These sites consist of the following:

Site No. 1 - POL Facility
Site No. 2 - Vehicle Maintenance Building
Site No. 3 - 5-Gallon Cans Under Antenna No. 1
Site No. 4 - 55-Gallon Drum on Equipment Building Porch
Site No. 5 - Drums, Cans and Canisters at North End of Equipment Building
Site No. 6 - Horizontal 55-Gallon Drums
Site No. 7 - Dump Area along East Unpaved Road
Site No. 8 - Permafrost Conductors
Site No. 9 - Disturbed Land

D. Recommendations

A Site Investigation monitoring program is recommended to confirm the presence or absence of HM/HW at each of the identified sites and to locate the landfill, if one exists. The details of the monitoring program, including sample locations, sample analysis, and data analysis, can be finalized as part of the Site Investigation program.

In the event that contaminants are detected, a more extensive field survey should be implemented to determine the extent of contaminant migration and potential effects to human and ecological receptors.

I. INTRODUCTION

A. Background

The United States Air Force, due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, State, and local governments have developed strict regulations to require that disposers of hazardous materials/hazardous wastes (HM/HW) identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner. The current Department of Defense (DoD) Installation Restoration Program (IRP) policy was directed by Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5 dated 11 December 1981, and implemented by Air Force message dated 21 January 1982, as a positive action to ensure compliance of military installations with existing environmental regulations. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the IRP. DoD policy is to identify and fully evaluate suspected problems associated with past HM/HW disposal sites on DoD facilities, to control the migration of hazardous contamination, and to control hazards to health and welfare that may have resulted from these past operations. The IRP is a basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and the Superfund Amendments and Reauthorization Act (SARA) of 1986.

To conduct the IRP Preliminary Assessment for Bethel Radio Relay Station (RRS), the Headquarters Alaskan Air Command/Directorate of Programs and Environmental Planning (HQ AAC/DEPV) retained the Hazardous Materials Technical Center (HMTC) (operated by Dynamac Corporation) in January 1988 under Contract No. DLA-900-82-C-4426.

The Preliminary Assessment comprises the first phase of the DoD IRP and is intended to review installation records to identify possible hazardous waste-contaminated sites and to assess the potential for contaminant migration

from the installation. The Site Investigation (not part of this contract) consists of follow-on field work as determined from the Preliminary Assessment. The Site Investigation includes a preliminary monitoring survey to confirm the presence or absence of contaminants. Upon confirmation of contamination, additional field work is implemented under a Remedial Investigation (not part of this contract) to determine the extent and magnitude of the contaminant migration and provide data necessary for determining appropriate remedial actions, which are evaluated during the Feasibility Study (not part of this contract). Research, Development, and Demonstration (not part of this contract) consists of a technology base development study to support the development of project plans for controlling migration or restoring the installation. Remedial Design/ Remedial Action (not part of this contract) includes those activities which are required to control contaminant migration or restore the installation.

B. Authority

The identification of hazardous waste disposal sites at Air Force installations was directed by Defense Environmental Quality Program Policy Memorandum 81-5 (DEQPPM 81-5) dated 11 December 1981, and implemented by Air Force message dated 21 January 1982, as a positive action to ensure compliance of Air Force installations with existing environmental regulations.

C. Purpose of the Preliminary Assessment

DoD policy is to identify and fully evaluate suspected problems associated with past hazardous material disposal sites and spill sites on DoD facilities, control the migration of hazardous contamination from such facilities, and control hazards to health or welfare that may have resulted from these past operations. HMTC evaluated the existence and potential for migration of HM/HW contaminants at Bethel RRS by visiting the installation; reviewing existing installation records concerning the use, generation and disposal of HM/HW; reviewing available environmental information; and conducting interviews with present Air Force personnel who are familiar with past hazardous materials management activities at the installation.

A physical inspection was made of the suspected sites. Relevant information collected and analyzed as a part of the Preliminary Assessment included the history of the installation, with special emphasis on the history of past operations and their past HM/HW management procedures; local geological, hydrological, and meteorological conditions that may affect migration of contaminants; and local land use that could affect the potential for exposure to contaminants; and the ecological settings that indicate environmentally sensitive habitats or evidence of environmental stress.

D. Scope

The Preliminary Assessment program included a pre-performance meeting, an onsite installation visit, a review and analysis of the information obtained, and preparation of this report.

The pre-performance meeting was held at HQ AAC/DEPV, Elmendorf Air Force Base, Alaska, on 13 June 1988. Attendees at this meeting included representatives of the HQ AAC/DEPV and HMTC. The purpose of the pre-performance meeting was to provide detailed project instructions, to provide clarification and technical guidance by AAC, and to define the responsibilities of all parties participating in the Bethel RRS Preliminary Assessment.

The scope of this Preliminary Assessment is limited to the installation and includes:

- An onsite visit;
- The acquisition of pertinent information and records on hazardous materials use and hazardous wastes generation and disposal practices at the installation;
- The acquisition of available geological, hydrological, meteorological, land use, and critical habitat data from various Federal, State and local agencies;
- A review and analysis of all information obtained; and
- The preparation of a report to include recommendations for further actions, if warranted.

The onsite visit, records search, and interviews with Air Force personnel were conducted during the period 13 to 23 June 1988 . The Preliminary Assessment site visit was conducted by Ms. Natasha Brock, Project Manager/Environmental Scientist; Ms. Betsy Briggs, Hazardous Waste Specialist; Mr. Lawrence Gladstone, Geophysicist; Mr. Dave Hale, Civil Engineer; and Mr. Raymond Clark, P.E./Department Manager (Appendix A). Other HMTC personnel who assisted with the Preliminary Assessment included Mr. Mark D. Johnson, P.G./Program Manager; and Ms. Janet Emry, Hydrogeologist. Personnel from AAC who assisted in the Preliminary Assessment included Mr. James W. Hostman, Chief, Environmental Planning HQ AAC/DEPV, and Mr. Jeffrey M. Ayres, Point of Contact (POC) at HQ AAC/DEPV.

E. Methodology

A flow chart of the Preliminary Assessment Methodology is presented in Figure 1. This Preliminary Assessment methodology ensures a comprehensive collection and review of pertinent site specific information, and is used in the identification and assessment of potentially contaminated hazardous waste spill/disposal sites.

The Preliminary Assessment begins with a site visit to the installation to identify all potential areas where contamination may have resulted from the use or disposal of HM/HW. Next, an evaluation of past HM/HW handling procedures at the identified locations is made to determine whether environmental contamination may have occurred. The evaluation of past HM/HW handling practices is facilitated by extensive interviews with Air Force personnel familiar with the various past operating procedures at the installation. The interviews also define the areas on the installation where any waste materials, either intentionally or inadvertently, may have been used, spilled, stored, disposed of, or released into the environment.

Historical records are collected and reviewed to supplement the information obtained from interviews. Using the information outlined above, a list of past

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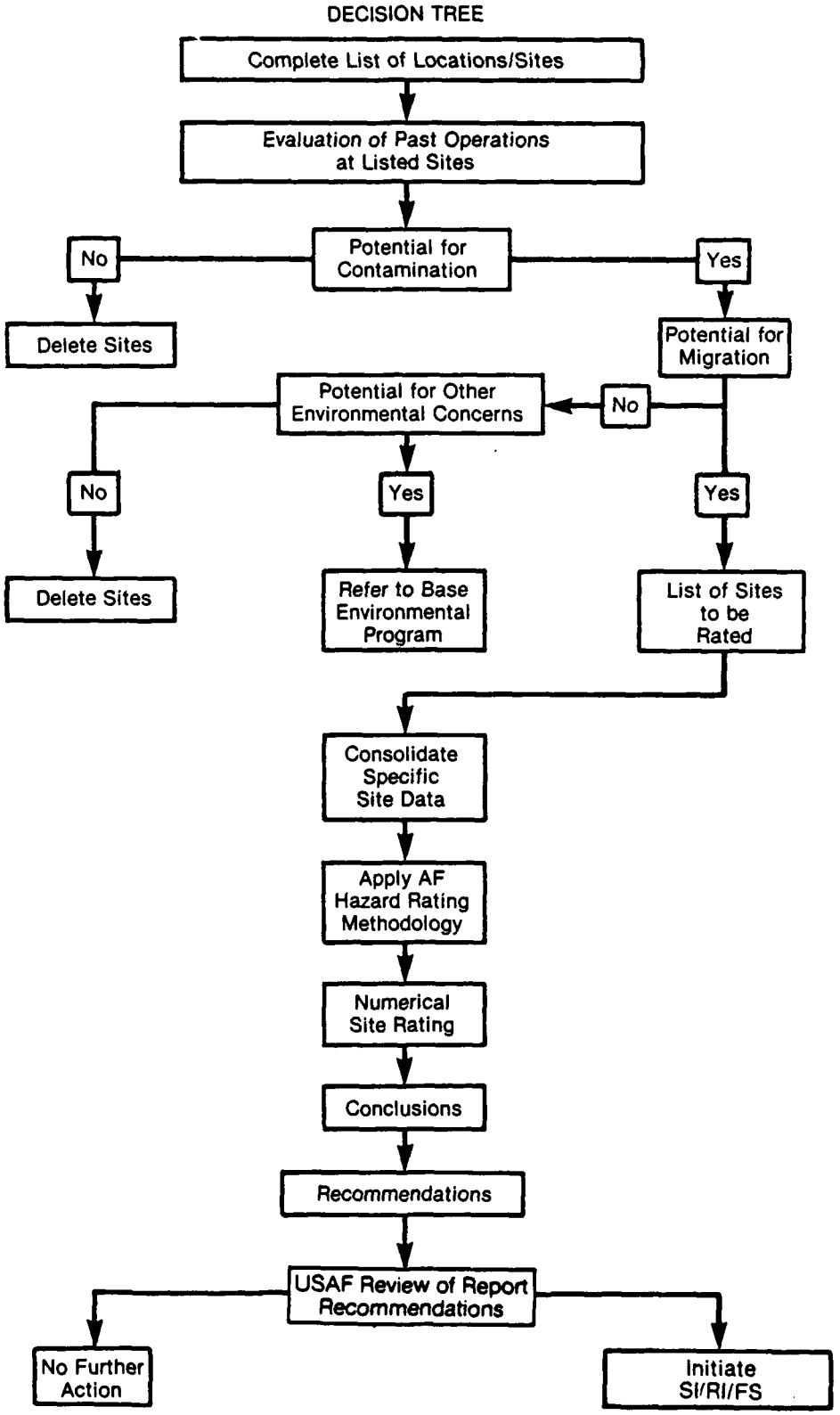
Figure 1.

Preliminary Assessment Methodology Flow Chart.



waste spill/disposal sites on the installation is identified for further evaluation. A general survey tour of the identified spill/disposal sites, the installation, and the surrounding area is conducted to determine the presence of visible contamination and to help assess the potential for contaminant migration. Particular attention is given to locating nearby drainage ditches, surface water bodies, residences, and wells.

Detailed geological, hydrological, meteorological, land use, and environmental data for the area of study are also obtained from the POC and from appropriate Federal, State and local agencies. A list of outside agencies contacted is provided in Appendix B. Following a detailed analysis of all the information obtained, sites are identified as suspect areas where HM/HW disposal may have occurred. Evidence at these sites suggests that they may be contaminated and that the potential for contaminant migration exists. Where sufficient information is available, sites are assigned a Hazard Assessment Score (HAS) using the U.S. Air Force Hazard Assessment Rating Methodology (HARM) (Appendix C). However, the absence of a HAS does not necessarily negate a recommendation for further IRP investigation, but rather may indicate a lack of data. The HAS for each site is computed from the data included in the Factor Rating Criteria (Appendix D).

II. INSTALLATION DESCRIPTION

A. Location

Bethel RRS is located in southwestern Alaska approximately 3 miles west of the village of Bethel, Alaska, and the Kuskowim River. Access to the RRS is by a road leading west from the village. Specifically, its location is Section 15, Township 8 North, Range 72 West, Seward Meridian (Figure 2). Although the land use within a one-mile radius of the RRS varies, for the purpose of this report, a residential setting will be referenced.

The unattended RRS has three pairs of 60-foot tropospheric-scatter antennas, two above ground fuel storage tank stands, a pump house, a 204,750-gallon tank and an equipment and power building. After 1960, two additional buildings were built, a facility support building and a vehicle maintenance building (see Figure 3 and Photographs 1 and 2, Appendix E).

The population within 1,000 feet of the RRS is calculated using the USGS Bethel (D-9) Quadrangle, Alaska, 7.5 Minute Series topographic map to count residences, assuming each dwelling unit has 3.8 residents (47 FR 31233). The residential population in the vicinity of Bethel RRS is zero, and as the RRS is unattended, the population is zero.

B. History

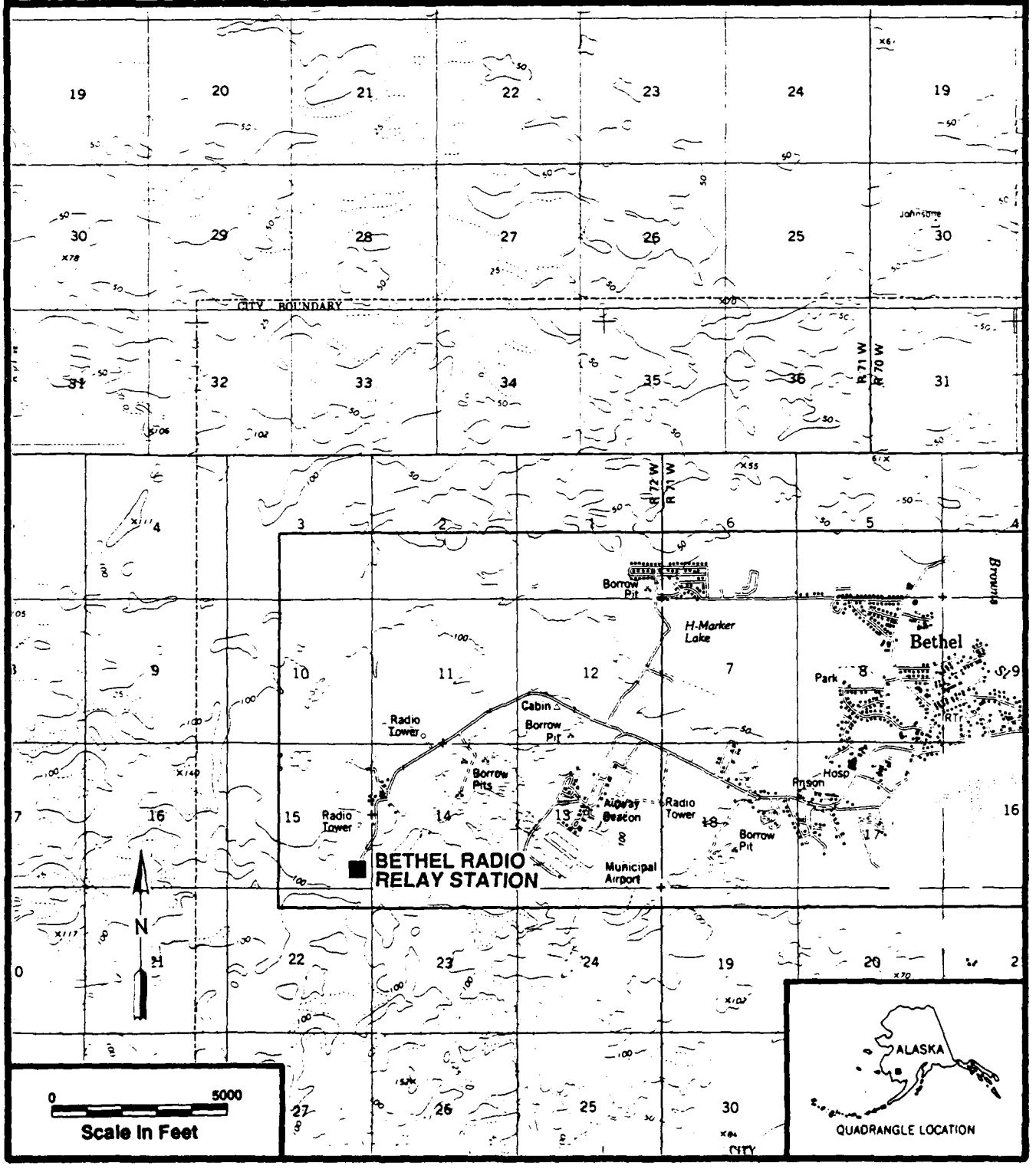
Bethel RRS was constructed in 1957 and was activated on 18 January 1958. The installation was part of the White Alice Communication System (WACS) comprised of the Aircraft Control and Warning (AC&W) System and the Distant Early Warning (DEW-line) System. The WACS linked AC&W facilities and DEW-line facilities into a network and relayed communications back to Elmendorf Air Force Base and Eielson Air Force Base. Bethel RRS was co-located with the Bethel AC&W facility and, therefore, many facilities at the AC&W were used by personnel stationed at the RRS. The installation was a 3-way link between Aniak RRS, Cape Newenham RRS, and Cape Romanzof RRS (Reynolds, 1988). The installation was deactivated in 1979.

HMTC

Source: U.S.G.S. Bethel (D-9) Quadrangle, Alaska, 7.5 Minute Series Topographic Map, 1985.

Figure 2.

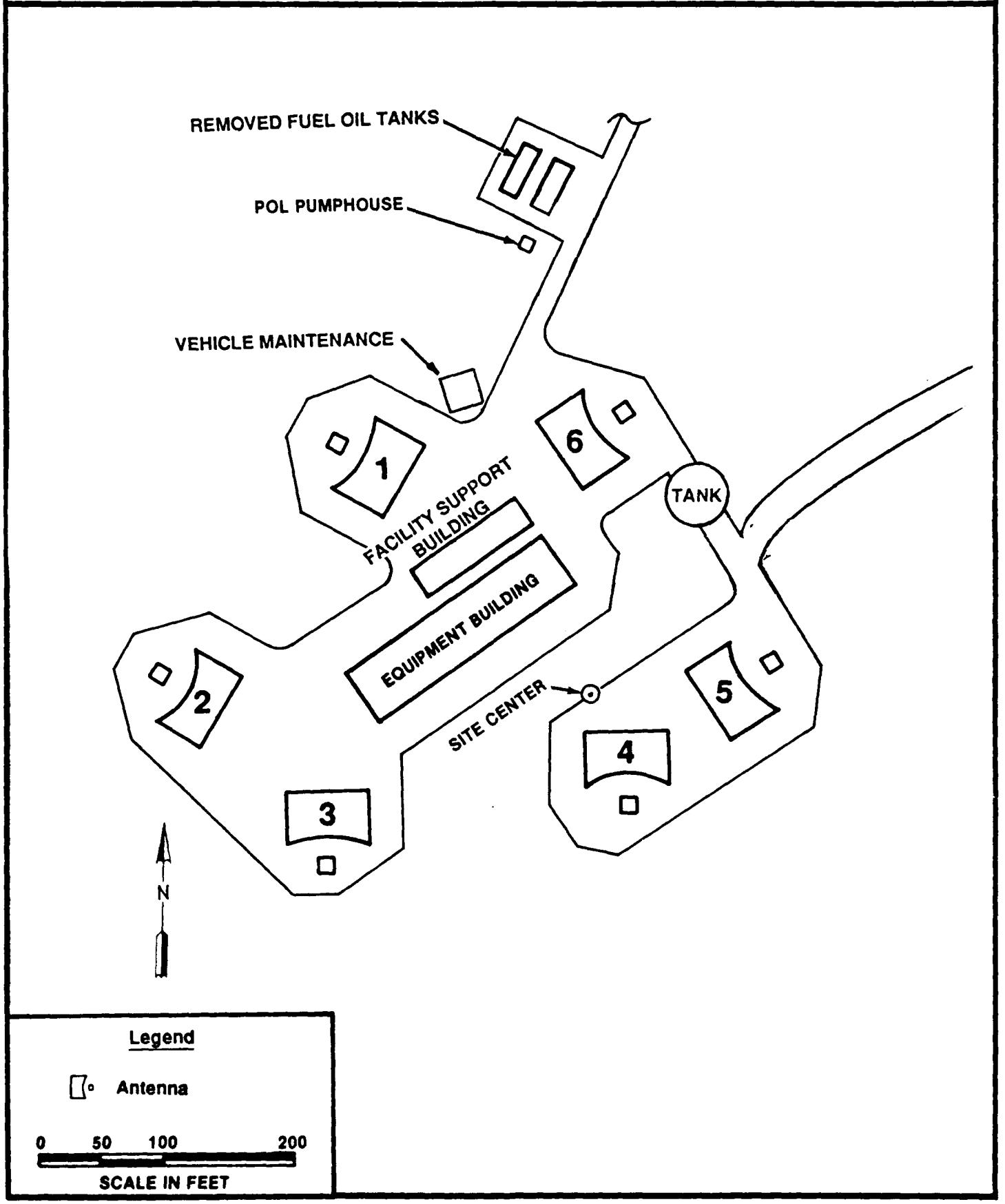
Location Map of Bethel Radio Relay Station, Alaska.



HMTC

Source: Bethel Air Force Station Contract Services ALAACS Region, 1960.

Figure 3.
Site Map of Bethel Radio Relay Station, Alaska.



III. ENVIRONMENTAL SETTING

A. Meteorology

The village of Bethel has a cold maritime climate, which is characterized by short cool summers and long cold winters. All the seasons have high humidity, frequent fogs, considerable cloudiness and many periods of light rain or snow showers. Middle and late summer is typically the wettest season. The average summer (June, July and August) temperature is 52.8°F and the average winter (December, January and February) temperature is 6.6°F. The mean annual precipitation is 16.91 inches (Hinton, 1967). The net precipitation, according to the method outlined in the Federal Register, is calculated by subtracting the mean annual lake evaporation from the annual precipitation (47 FR 31227). Since the mean annual lake evaporation rate was not available for this part of Alaska, the annual potential evapotranspiration rate was used (NOAA, personal communication, 1988). The potential evapotranspiration rate is 16.81 inches per year (Patric and Black, 1968), therefore, the net precipitation is 0.10 inches per year. The maximum 24-hour, 10-year rainfall intensity is 2.5 inches (Miller, 1963).

B. Geology and Soils

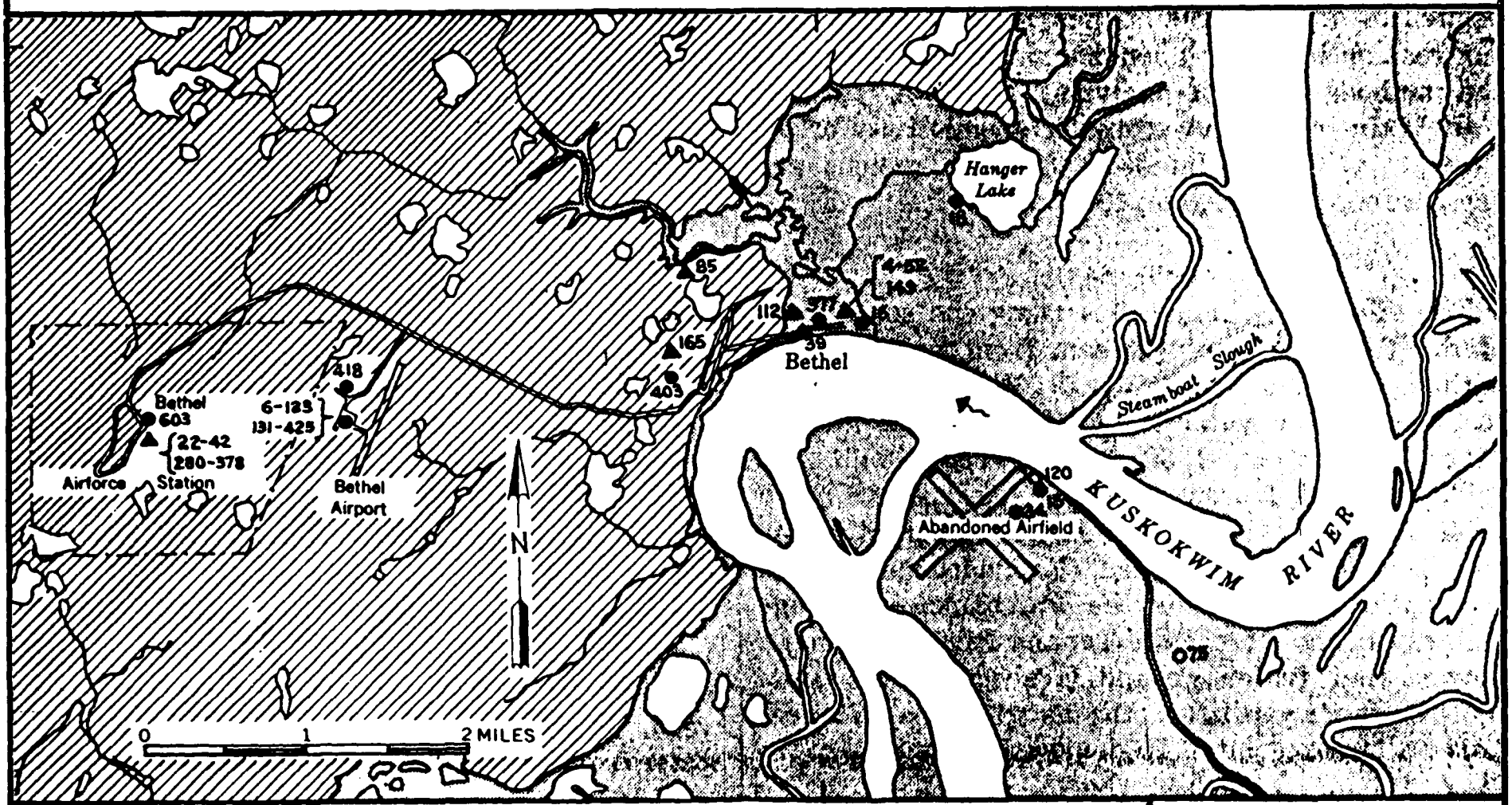
Bethel RRS is underlain by Quaternary silt deposits of the Yukon-Kuskowim delta, which consist chiefly of light- to dark-gray silt and sandy silt containing abundant permafrost (see Figure 4). Organic muck, containing mammoth remains and nonmarine gastropods, occur locally near the top of these deposits, which become sandier with depth and locally contain pebbles and wood fragments (Beikman, 1974). Subsurface data from wells near Bethel document as much as 184 meters (603 feet) of silt, fine sand, and sparse gravel layers. Organic material, including wood chips and bark, suggests that these are freshwater estuarine deposits (Pewe, 1975). These deposits apparently thicken westward, and at Bethel have a minimum thickness of 450 feet. The silt deposits may also include eolian and marine members in some areas. Silt underlies much of the

HMTC

Source: Groundwater in the Permafrost Regions of Alaska, 1970.

Figure 4.

Well Locations and Geology of the Bethel Area



Legend

Flood-plain and low-terrace alluvium

Delta deposits

Chiefly sand, silt, and some gravel

075
Well reported drilled in unfrozen sediment; number is depth

● 412
Well or test hole in which water was obtained beneath frozen sediment at depth indicated or between layers of frozen ground which was logged at depths shown in brackets

▲ 39
Well or test hole which failed to reach base of frozen ground at depth indicated; some wells produced water from unfrozen sediment between frozen zones, indicated by numbers in brackets

Yukon-Kuskowim delta, where it forms a wide plain at a general altitude of 10 to 150 feet above sea level. The best exposures of these deposits are cut-bank outcrops along major rivers (Beikman, 1974).

Approximately 3.6 miles east of the RRS is the Kuskowim River and its Pleistocene deposits of flood plain and low terrace alluvium. These deposits consist mainly of mud, silt, sand, gravel, boulders, and considerable organic matter (Beikman, 1974). The alluvium ranges from 230 to 360 feet in thickness (Pewe, 1975). These deposits are related to glacial advances from the nearby Alaska Range. In Illinoian time, considerable deposition of alluvium occurred which were later eroded and dissected by streams and rivers in Sangamon time. In Wisconsinan time, deposits of fluvial origin were predominant in this area.

According to the USDA Soil Conservation Service, the RRS is underlain by the Kuskowim - Kwethluk Complex (see Figure 5). The complex is intertwined such that mapping them separately is not feasible. The Kwethluk soils occur in small areas from 3 to 10 acres on low knolls, convex slopes boardering drainage ways and areas adjacent to drained thaw lakes. Kuskiwim soils are found on the level areas between the slopes and knolls of the Kwethluk soils.

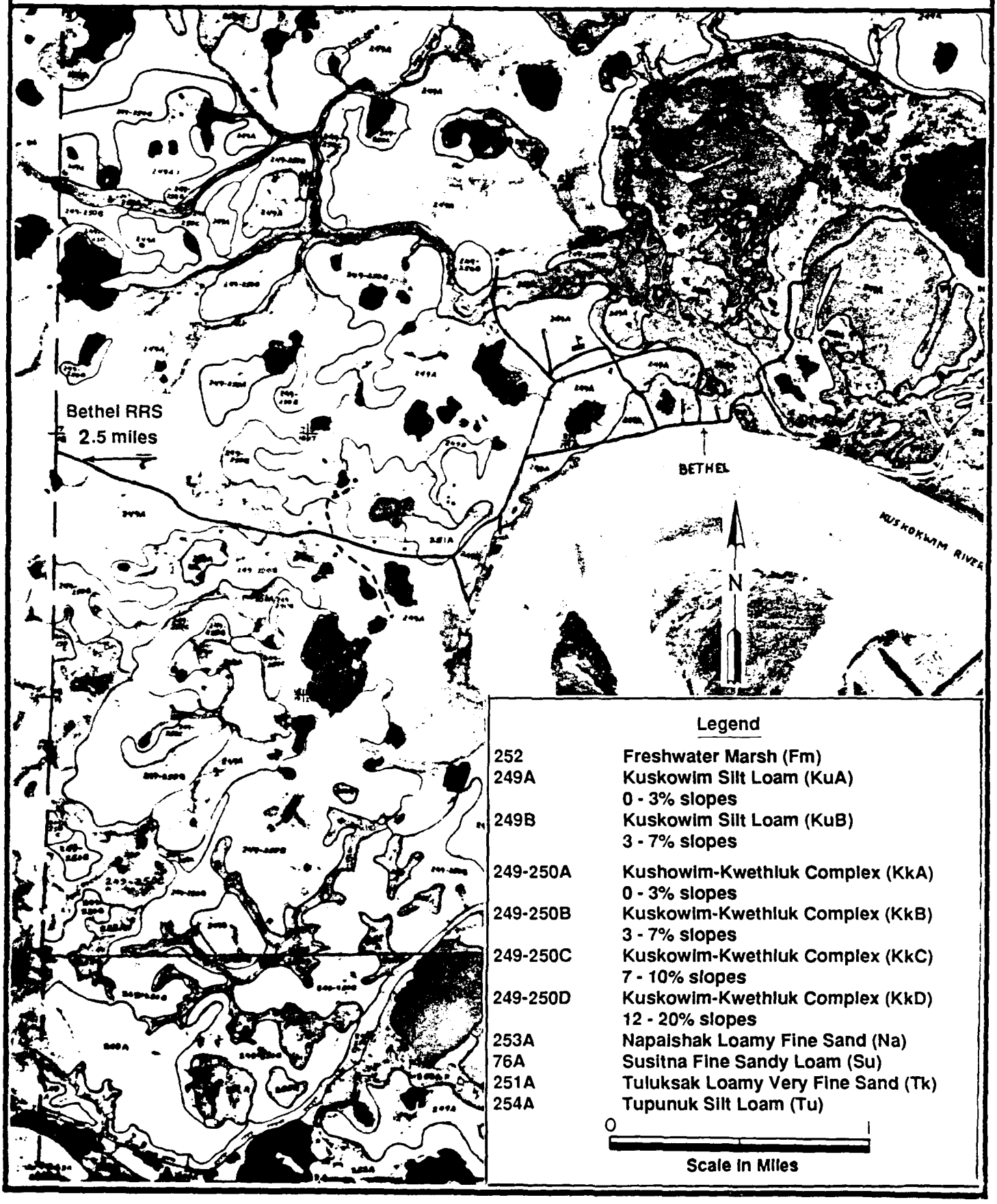
In the field, the two soils can be identified by their differences in slope, vegetation, drainage, and texture. The Kuskowim soils have a thick surface mat and a large proportion of sedges and sphagnum moss; the water table is generally near the surface; and the texture is silty in the upper part. The Kwethluk soils have a thin mat with polytrichum moss and low growing shrubs and forbs; the water table is several feet deep by mid-summer; and the texture is sandy throughout.

A typical profile of the Kuskowim soil consists of a peaty mat of approximately 12 inches over dark gray silt loam mottled with dark brown silt loam in the upper few inches, changing to gray silt loam with sand lenses to depths to 60 inches. The soil has a moderate thin platy structure is friable and very strongly acid. Perched water is found over the permafrost; typically the soil is saturated to the surface. The permability is slow (4.24×10^{-5} to 1.41×10^{-4} cm/sec) and the erosion hazard is none.

HMTC Source: Hinton and Girdner, May 1972.

Figure 5.

Soil Survey of Bethel Radio Relay Station, Alaska and Vicinity.



A typical Kwethluk soil profile consists of a thin mat of organic materials and dark brown to brown sandy surface horizons, changing to olive gray to olive with depth. The permafrost is found at depths greater than 40 inches and the soil is generally saturated above the permafrost. The permeability is slow (4.24×10^{-5} to 1.14×10^{-4} cm/sec) and the erosion hazard is slight.

C. Hydrology

Surface Water

The major surface water feature in the Bethel area is the Kuskowim River. The RRS is located approximately 3.6 miles to the west of the river, and is not within its flood plain. The land surrounding the RRS includes wetlands and is bordered by many small lakes and ponds typical of glacial moraine topography. One source of water in the Bethel area is from nearby large flood plain lakes (i.e, Hanger Lake) (see page III-2). There are two creeks that flow north of the RRS into small unnamed ponds.

Groundwater

Groundwater in Bethel is obtained from the flood plain and low-terrace alluvium deposits of the Kuskowim River in permafrost-free areas close to the river, and from deep sands beneath the permafrost. The flood plain and low terraces are bounded on the west by a terrace escarpment that separates these deposits from an older portion of the Yukon-Kuskowim delta and a portion of the coastal lowlands. Frozen ground recorded in wells less than 20 feet deep occurs in flood plain and low terrace alluvium on an island in the Kuskowim River and near Hanger Lake. In the village, between the creek and the terrace escarpment, these deposits are frozen to depths of 377 feet. The thick permafrost may be accounted for by postulating that the river has been in its present position too short of a time period to thaw the permafrost at depth. Partial degradation of permafrost by a rapidly migrating river is suggested for the layered permafrost found in a 149-foot well in Bethel. Permafrost extends from near the surface

to a depth of 603 feet in the dissected terrace that forms the older part of the delta west of Bethel (Williams, 1970).

Groundwater in deltaic sand deposits and in thin beds of gravel is confined beneath the permafrost. It rises in wells near Bethel to a static water level approximately equal to that of the Kuskowim River, and its level fluctuates with tides and stages of the river. The water below the permafrost at Bethel is potable (Williams, 1980).

There are two wells on RRS property (Groundwater in the Permafrost Regions of Alaska, 1970), however, they were not located during the site visit and are not presently in use. The nearest wells to the RRS are approximately 6,000 feet away, located at the Bethel Airport (see Figure 4, page III-2). The town of Bethel is entirely supplied by groundwater.

D. Critical Habitats/Endangered or Threatened Species

According to the U.S. Fish and Wildlife Service, Alaska Division, there are no endangered or threatened species, and federally- or state-designated critical habitats or wilderness areas within a 1-mile radius of the RRS. Although the Bethel area has not been mapped by the National Wetland Inventory at this time, the U.S. Fish and Wildlife Service believes that wetlands probably exist within the vicinity of the RRS.

IV. FINDINGS

A. Activity Review

A review of RRS records and interviews with AAC personnel resulted in the identification of specific operations at the RRS which the majority of HM/HW were handled and generated. These operations included:

- Management of diesel fuel to power generators;
- Management of motor gasoline (MOGAS), oil, hydraulic fluid, and ethylene glycol to operate and maintain vehicles;
- Possible handling of electrical equipment containing PCBs;
- Usage of lead-acid and nickel-cadmium batteries for storage electricity; and
- Usage of asbestos as a construction material

B. Disposal/Spill Site Identification, Evaluation, and Hazard Assessment

Interviews with Air Force personnel and subsequent site inspections resulted in the identification of nine sites potentially contaminated with HM/HW. The locations of these sites are indicated in Figure 6.

The nine sites were assigned HAS scores according to HARM (Appendix C). Copies of the completed Hazard Assessment Rating Forms are found in Appendix D. Table 1 summarizes the HAS for each of the scored sites. The objective of this assessment is to provide relative ranking of sites suspected of contamination from hazardous substances. The final rating score reflects specific components of the hazard posed by a specific site: possible receptors of the contamination (e.g., population within a specified distance of the site and/or critical environments within a 1-mile radius of the site); the waste and its characteristics; and the potential pathways for contaminant migration (e.g., surface water, groundwater, flooding). Brief descriptions of all the sites follow.

HMTC

Source: Bethel Air Force Station Contract Services ALAACS Region, 1960.

Figure 6.

Map of Identified IRP Sites Bethel Radio Relay Station, Alaska.

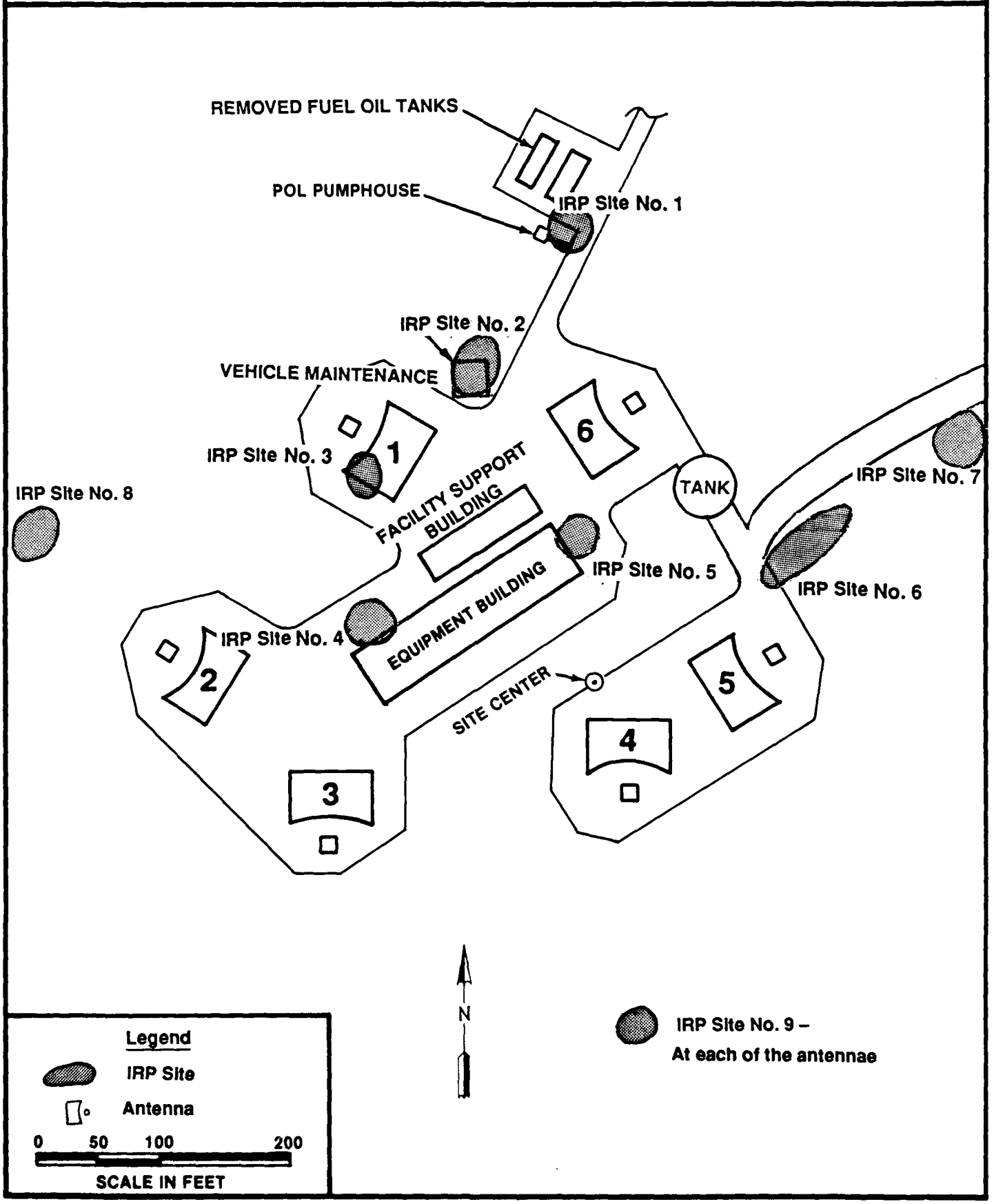


Table 1. Site Hazard Assessment Scores (as derived from HARM): Bethel Radio Relay Station, Bethel, Alaska

Site Priority	Site No.	Site Description	Receptors	Waste Characteristics	Pathway	Waste Mgmt. Practices	Overall Score
1	6	Horizontal 55-Gallon Drums	60	40	80	1.0	60
2	9	Disturbed Land	60	40	80	1.0	60
3	7	Dump Area along East Unpaved Road	60	40	80	1.0	60
4	2	Vehicle Maintenance Building	57	40	80	1.0	59
5	3	5-Gallon Cans under Antenna No. 1	57	40	80	1.0	59
6	4	55-Gallon Drum on Equipment Building Porch	57	40	80	1.0	59
7	5	Drums, Cans, and Canisters at North end of Equipment Building	57	40	80	1.0	59
8	8	Permafrost Conductors	60	32	80	1.0	57
9	1	POL Facility	57	32	80	1.0	56

Site No. 1 - POL Facility (HAS-56)

Two fuel tank stands and their associated piping are located on the right-hand side of the road to the RRS. The fuel tanks have been removed, but the pipes are still intact. Stained soil and a strong fuel odor were observed. However, results obtained with the photoionization detector (PID) were negative. The soil was stained to a depth of several inches and covered an area approximately 20 feet by 20 feet by the pumphouse and 10 feet by 20 feet in the concrete holders and 3 feet by 5 feet at the ends of the holders. Photographs 3, 4, and 5 (Appendix E) show these areas.

The POL facility was scored assuming a small quantity release; Sax's Level 3 toxicity; flash point at 140°F to 200°F; straight chain hydrocarbon compound; and liquid state.

Site No. 2 - Vehicle Maintenance Building (HAS-59)

The Vehicle Maintenance building was heavily ransacked, showing major damage. Unlabeled drums, stained soil, and general debris were located around the outside of the building. The stained areas were approximately 3 feet in diameter. Unlabeled cans and drums were also found at the stained areas. Photographs 6, 7, 8, and 9 (Appendix E) show these areas. Inside the building, drums of isopropyl alcohol, lube oil, refrigerant compressor, paint, white oil, oil sludge, transmission fluid, and rust inhibitor were found in various stages of deterioration. Also various vehicle parts, filters, and debris were found (see Photographs 10, 11, 12, 13 and 14; Appendix E). A fuel pump is located outside of the building on the east side (see Photograph 15; Appendix E). It is unknown if the pump was supplied directly from the tanks at the POL Facility or if it was connected to an underground storage tank.

The vehicle maintenance building was scored assuming a small quantity release; Sax's Level 3 toxicity; flash point at 140°F at 200°F; straight chain hydrocarbon compound; and liquid state.

Site No. 3 - 5-Gallon Cans under Antenna No. 1 (HAS-59)

Four unmarked 5-gallon cans located under Antenna No. 1 were found leaking a dark sticky substance. The leaking material was confined to a small area no larger than 3 feet from around the cans. Photograph 16 (Appendix E) shows this site.

The site was scored assuming a small quantity release; Sax's Level 3 toxicity; flash point at 140°F to 200°F; metals, polycyclic and halogenated compounds; and a liquid state.

Site No. 4 - 55-Gallon Drum on Equipment Building Porch (HAS-59)

A leaking 55-gallon drum was found on the porch of the Equipment Building. A large stained area was observed around the drum, on the ground, and on the porch and support material. The stained area covered an area under the porch and under the building of approximately 20 feet by 30 feet. The leaking material was an unidentified yellowish-brown material. Results from a PID survey were positive. Photographs 17, 18, and 19 (Appendix E) show this site.

The drum site was scored assuming a small quantity release; Sax's Level 3 toxicity; flash point at 140°F to 200°F; metals, polycyclic and halogenated compounds; and a liquid state.

Site No. 5 - Drums, Cans, and Canisters at North End of Equipment Building (HAS-59)

At the north end of the Equipment Building, six unlabeled drums containing either a black or yellow oily substance were found. Some of the drums were partially full; others were empty. Leakage was evident and extended over a distance of 30 feet by 10 feet. The condition of the drums ranged from slightly weathered to crushed. The drums were numbered in sequence from D-2 through D-6, and D-9; drum D-9 was found at Vehicle Maintenance (see Photograph 15; Appendix E). Empty fire extinguisher canisters, unlabeled 5-gallon cans, and empty drums of ethylene glycol under the building were

also found at this site. Photographs 20, 21, 22, 23, 24, and 25 (Appendix E) show this site.

The site was scored assuming a small quantity release; Sax's Level 3 toxicity, flash point at 140°F to 200°F; metals, polycyclic and halogenated compounds; and a liquid state.

Site No. 6 - Horizontal 55-Gallon Drums (HAS-60)

Twelve unlabeled 55-gallon drums, lying horizontally, were found northeast of Antenna No. 5, at the entrance of the unpaved road leading east from the RRS (see Photograph 26; Appendix E). The drums had been gun shot, allowing the contents to drain onto the ground. The drums also showed signs of rust. The contents of eight of the drums appeared to be a black, thick, sticky substance (see Photograph 27; Appendix E). Results from a PID survey were negative. The material leaked no more than a few feet. The other four drums leaked a thin, clear substance leaving a stain approximately 30 feet by 10 feet (see Photograph 28; Appendix E).

The drum site was scored assuming a small quantity release; Sax's Level 3 toxicity; flash point at 140°F to 200°F; metals, polycyclic and halogenated compounds; and a liquid state.

Site No. 7 - Dump Area along East Unpaved Road (HAS-60)

A dump site was found approximately 100 yards along the unpaved road leading east from the RRS. The area is in the bushes on the right-hand side of the road. The area contained 55-gallon drums, 5-gallon cans, and construction scrap. The cans contained paint and paint thinner. The contents of the drums could not be determined. Any staining could not be determined due to the thick foliage, however, a PID survey indicated 2 to 3 ppm of volatile constituents. Photographs 29, 30, 31, and 32 (Appendix E) show this site.

The dump area was scored assuming a small quantity release; Sax's Level 3 toxicity; flash point at 140°F to 200°F; metals, polycyclic and halogenated compounds; and a liquid state.

Site No. 8 - Permafrost Conductors (HAS-57)

On each support leg of all the antennae is a conductor which was used to test the depth of the permafrost. Oil was poured into the leg and a conductor was used to test for the permafrost depth. Photographs 33 and 34 (Appendix E) show the conductor and the oil around one of the antenna legs, respectively. During the site visit, oil stains with an approximate radius of one foot, around the legs were observed. Each antenna has 14 conductors and there are six antenna, thus giving a total of 84 oil stained areas.

The site was scored assuming a small quantity release; Sax's Level 3 toxicity; flash point at 140°F to 200°F; straight chain hydrocarbon compound; and a liquid state.

Site No. 9 - Disturbed Land (HAS-60)

A disturbed area was located approximately 75 yards west of Antenna No. 1 and No. 2. This area was approximately 20 feet by 20 feet, showed signs of vegetative stress, stained soil and uneven surface relief. By comparison, the surrounding area has even foliage cover, complete soil coverage and is relatively flat. No information exists on the nature of past activities in this area. However, the disturbed nature of the ground may indicate a filled excavation. Photograph 35 (Appendix E) shows this area.

The site was scored assuming a small quantity release; Sax's Level 3 toxicity; flash point at 140°F to 200°F; metals, polycyclic and halogenated compounds; and a liquid state.

C. Other Pertinent Information

- The Equipment and Power Building contained fuel tanks, generators, damaged asphalt floor tiles, and 63 lead-acid batteries, 12 of which were intact. Photographs 36, 37, 38, 39, and 40 (Appendix E) show these items.

- The facility support building contained a 5-gallon can of cutting oil, twenty-three batteries in varied conditions, and general trash (see Photograph 41; Appendix E). The remaining equipment was in heavily damaged condition and consisted of metal, glass, and wire.

- In addition to the sites and buildings, additional 55-gallon drums, 5-gallon cans and general debris were found throughout the site (see Photographs 42 and 43; Appendix E) and in the adjacent foliage around the RRS. All of the containers were either empty or partially filled. Their condition varied from slightly rusted to crushed and/or gun shot. A PID survey was conducted on the drums to analyze for organic vapors. The results of this survey were negative.

- A small building was located approximately 75 yards southeast from the main area (see Photograph 44; Appendix E). The building's interior was not accessible. Therefore, its function and contents could not be determined. General debris was found around the building including fire extinguisher canisters.

- Although a landfill on RRS property could not be located, it was common practice to bury drums and waste liquids at similar facilities.

- Approximately 200 yards on the east unpaved road, a landfill was located. The soil from the area had been removed, however, general debris including drums and cans were found. It is questionable whether this land is RRS property, since domestic debris was also found including furniture and children's bicycles. Photographs 45 and 46 (Appendix E) show this area.

V. CONCLUSIONS

Information obtained through interviews with Air Force Personnel, review of installation records, and field observations indicates that hazardous wastes have been disposed of or spilled on the Bethel RRS property. As a result, nine potentially contaminated disposal and/or spill sites have been identified. These sites consist of the following:

Site No. 1 - POL Facility
Site No. 2 - Vehicle Maintenance Building
Site No. 3 - 5-Gallon Cans under Antenna No. 1
Site No. 4 - 55-Gallon Drum on Equipment Building Porch
Site No. 5 - Drums, Cans, and Canisters at North End of Equipment Building
Site No. 6 - Horizontal 55-Gallon Drums
Site No. 7 - Dump Area along East Unpaved Road
Site No. 8 - Permafrost Conductors
Site No. 9 - Disturbed Land

Each of these sites is potentially contaminated with HM/HW and each exhibit the potential for contaminant migration to groundwater and surface water. Therefore, these sites were assigned a HAS according to HARM.

The potential for contaminant migration exists due to the climate, which has frequent rain and snow showers, therefore supplying the medium for transportation of contaminants through the soil to the shallow water table or over the ground surface to nearby surface waters. Vertical migration could be slow due to the poorly drained soils, however, the numerous ponds present have the potential for high contamination levels. Due to the permafrost, the migration of groundwater is in a lateral direction as opposed to a vertical direction. This groundwater would serve as a recharge source to the Kuskowim River. Water wells in the village of Bethel are located upgradient from the RRS, so the potential for contamination of these wells is minimal.

VI. RECOMMENDATIONS

A Site Investigation, consisting of a limited monitoring program, is recommended to confirm the presence or absence of hazardous contaminants at Bethel RRS. The priority for monitoring at Bethel RRS is considered moderate, since no imminent hazard has been determined.

Site No. 1 - POL Facility

For the POL facility, it is recommended that the piping, pump house, and fuel pump be removed. The presence of an underground tank at the fuel pump needs to be determined. If one is present, removal is recommended. In order to ascertain the extent of soil contamination, soil sampling/ surveying should be conducted and the contaminated soil removed and disposed of properly in accordance with applicable regulations. A groundwater monitoring system should also be considered, pending the results of the soil sampling, to determine any migration of hazardous contaminants.

Site No. 2 - Vehicle Maintenance Building

It is recommended that the Vehicle Maintenance building be cleaned up including the removal of the abandoned vehicles, 55-gallon drums, 5-gallon cans, and maintenance debris. Outside of the building, debris and stained soil need to be removed. In order to asertain the vertical and lateral extent of contamination, soil sampling/surveying is recommended, and the contaminated soil removed and disposed of properly in accordance with applicable regulations.

Site No. 3 - 5-Gallon Cans under Antenna No. 1

It is recommended that the 5-gallon cans and the stained soil around the cans be removed. In order to ascertain the vertical and lateral extent of contamination, soil sampling/surveying is recommended and the soil removed and disposed of properly in accordance with applicable regulations.

Site No. 4 - 55-Gallon Drum on Equipment Building Porch

Removal of the leaking 55-gallon drum is recommended to mitigate the source of contamination at this site. Removal of the porch and the stained soil under and leading away from the porch is also recommended. In order to ascertain the vertical and lateral extent of soil contamination, sampling/surveying is recommended and the soil removed and disposed of in accordance with applicable regulations.

Site No. 5 - Drums, Cans, and Canisters at North End of Equipment Building

Removal of the drums, cans, and canisters at the north end of the Equipment Building is recommended. Soil surveying/sampling is recommended to ascertain the vertical and lateral extent of contamination for complete removal of the contaminated soil. The drums, cans, canisters, and soil should be disposed of properly in accordance with applicable regulations.

Site No. 6 - Horizontal 55-Gallon Drums

Removal of the drums and soil is recommended for this site. The drums should be overpacked and disposed of properly. The soil should be sampled/surveyed to ascertain the extent of vertical and lateral contamination, removed, and disposed of properly according to applicable regulations.

Site No. 7 - Dump Area along East Unpaved Road

The dump area should be cleared of all construction debris and the containers removed and disposed of properly. Sampling/surveying should be conducted to determine the vertical and lateral extent of soil contamination, excavated and disposed of properly, according to applicable regulations.

Site No. 8 - Permafrost Conductors

Soil sampling/surveying is recommended to ascertain the extent of lateral and vertical contamination. The contaminated soil should be removed and disposed of according to applicable regulations.

Site No. 9 - Disturbed Area

The questionable hazard potential of this site will make the determination of any contamination or buried material more difficult. Remote surveying, using geophysical methods, is recommended to ascertain if the area is a landfill, which may contain drums, cans, and canisters. Soil sampling/surveying is recommended to ascertain the vertical and lateral extent of contamination outside of the disturbed area. The contaminated soil and the source of contamination should be removed and properly disposed of according to applicable regulations. Further actions taken at this site should be based on the results of these initial efforts.

It is also recommended that an investigation be performed to locate the possible landfill, determine if its contents are hazardous, remove the waste and any contaminated soil, and dispose of the waste according to State and Federal regulations.

GLOSSARY OF TERMS

ALLUVIUM - A general term for clay, silt, sand, gravel, or similar unconsolidated material deposited during comparatively recent geologic time by a stream or running water.

ANNUAL PRECIPITATION - The total amount of rainfall and snowfall for the year.

AQUIFER - A geologic formation, or group of formations, that contains sufficient saturated permeable material to conduct groundwater and to yield economically significant quantities of groundwater to wells and springs.

BASEMENT - The undifferentiated complex of rocks that underlies the rocks of interest in an area.

BED [stratig] - The smallest formal unit in the hierarchy of lithostratigraphic units. In a stratified sequence of rocks it is distinguishable from layers above and below. A bed commonly ranges in thickness from a centimeter to a few meters.

BEDROCK - A general term for the rock, usually solid, that underlies soil or other unconsolidated, superficial material.

BOG - Waterlogged, spongy ground, consisting primarily mosses, containing acidic, decaying vegetation that may develop into peat.

BOULDER - A detached rock mass larger than a cobble, having a diameter greater than 256 mm, being somewhat rounded or otherwise distinctly shaped by abrasion in the course of transport.

COAST - A strip of land of indefinite width that extends from the lowtide line inland to the first major change in landform features.

CONTAMINANT - As defined by Section 101(f)(33) of Superfund Amendments and Reauthorization Act of 1986 (SARA) shall include, but not be limited to any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation in such organisms or their offspring; except that the term "contaminant" shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under:

(a) any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act,

(b) any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act,

(c) any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act has been suspended by Act of Congress),

(d) any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act,

(e) any hazardous air pollutant listed under Section 112 of the Clean Air Act, and

(f) any imminently hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to Section 7 of the Toxic Substance Control Act;

and shall not include natural gas, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas).

CONVEX - Curving outward like the surface of a sphere.

CREEK - A term generally applied to any natural stream of water, normally larger than a brook but smaller than a river.

CRITICAL HABITAT [Fed] - The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of the Endangered Species Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management consideration or protection; and specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of the Endangered Species Act, upon a determination by the Secretary that such areas are essential for the conservation of the species.

CRITICAL HABITAT [Alaska] - Places where protective emphasis is on the environment in which wildlife occurs. Critical habitats may be complete biotic systems -- identifiable environmental units that operate as self-sustaining systems -- or well-defined areas specifically needed by wildlife for certain functions such as nesting or spawning.

CUT-BANK - A local term in the western U.S. for a steep bare slope formed by lateral erosion of a stream.

DELTA - The low, nearly flat, alluvial tract of land at or near the mouth of a river, commonly forming a triangular or fan-shaped plain of considerable area.

DELTAIC - Pertaining to or characterized by a delta.

DEPOSITS - Earth material of any type, either consolidated or unconsolidated, that has accumulated by some natural process or agent.

DRAINAGE CLASS [natural] - Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered

drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained - Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained - Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained - Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured, and are mainly free of mottling.
Moderately well drained - Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained - Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained - Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough periods during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained - Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

DRAINAGEWAY - A channel or course along which water moves in draining an area.

ENDANGERED SPECIES - Any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of the Endangered Species Act would present an overwhelming and overriding risk to man.

EOLIAN - Pertaining to or formed or living in an estuary.

ESCARPMENT - A long, more or less continuous cliff or relatively steep slope facing in one general direction.

ESTUARINE - Pertaining to or formed or living in an estuary, especially said of deposits and sediments or biological environment of an estuary.

ETHYLENE GLYCOL - A colorless, sweetish alcohol $C_2H_4(OH)_2$, formed by decomposing certain ethylene compounds and used as an antifreeze mixture, lubricant, etc.

FLASH POINT - The lowest temperature at which the vapors of combustible liquids, especially fuels, will ignite.

FLOOD PLAIN - The surface or strip of relatively smooth land adjacent to a river channel, constructed by the present river in its existing regimen and covered with water when the river overflows its banks.

FLUVIAL - Of or pertaining to a river or rivers.

FOG - A cloud at the Earth's surface.

FORB - A noncultivated dicotyledonous herbaceous plant; a herb other than grass; a weed.

FORMATION - A lithologically distinctive, mappable body of rock.

FRAGMENT - (a) A rock or mineral particle larger than a grain. (b) A piece of rock that has been detached or broken from a pre-existing mass.

GASTROPODS - Any mollusk belonging to the class Gastropoda, characterized by a distinct head with eyes and tentacles, and in most a single shell that is closed at the apex, e.g. a snail.

GRAVEL - An unconsolidated, natural accumulation of rounded rock fragments resulting from erosion, consisting predominantly of particles larger than sand, such as boulders, cobbles, pebbles, granules or any combination of these fragments.

GROUNDWATER - Refers to the subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated.

HARM - Hazard Assessment Rating Methodology - A system adopted and used by the United States Air Force to develop and maintain a priority listing of potentially contaminated sites on installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, 11 December 1981.)

HAS - Hazard Assessment Score - The score developed by using the Hazardous Assessment Rating Methodology (HARM).

HAZARDOUS MATERIAL - Any substance or mixture of substances having properties capable of producing adverse effects on the health and safety of the human being. Specific regulatory definitions also found in OSHA and DOT rules.

HAZARDOUS WASTE - A solid or liquid waste that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

a. cause, or significantly contribute to, an increase in mortality or an increase in serious or incapacitating reversible illness, or

b. pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

HORIZON [soil] - A layer of soil approximately parallel to the surface, having distinct characteristics produced by soil-forming processes.

HUMIDITY [climate] - The water-vapor content of the atmosphere.

IGNITABILITY - The ability of a substance to burn or catch fire.

ILLINOIAN - Pertaining to the classical third glacial stage of the Pleistocene Epoch in North America.

KNOB - A rounded eminence, as a knoll, hillock, or small hill or mountain.

KNOLL [geomorph] - A small, low, rounded hill; a hillock or mound.

LAKE - Any inland body of standing water occupying a depression in the Earth's surface, generally of appreciable size (larger than a pond) and too deep to allow land plants to take root across the expanse of water.

LENS - A geologic deposit bounded by converging surfaces (at least one of which is curved), thick in the middle and thinning out toward the edges, resembling a convex lens. A lens may be double-convex or plano-convex.

LOWLAND - A general term for low-lying land or an extensive region of low land, esp. near the coast and including the extended plains or country lying not far above tide level.

MAMMOTH - A large, once very abundant, now extinct elephant, related to the Indian elephant.

MARINE - Of, pertaining to, or characteristic of the sea.

MARITIME [climate] (marine climate) - The climate of the islands and of the lands bordering the ocean, characterized by only moderate diurnal and annual temperature ranges and by the occurrence of maximum and minimum temperatures longer after the summer and winter solstices, respectively.

MEAN LAKE EVAPORATION - The total evaporation amount for a particular area; amount based on precipitation and climate (humidity).

MOTTLED [soil] - a soil that is irregularly marked with spots or patches of different colors, usually indicating poor aeration or seasonal wetness.

MUCK [sed] - Dark finely divided well decomposed organic material, intermixed with a high percentage of mineral matter, usually silt.

NATURAL AREA - An area of land or water that has retained its wilderness character, although not necessarily completely natural and undisturbed, or that has rare or vanishing flora, fauna, archaeological, scenic, historical, or similar features of scientific or educational value.

NET PRECIPITATION - Precipitation minus evaporation.

OIL - A petroleum product.

ORGANIC - Pertaining or relating to a compound containing carbon, esp. as the essential component.

OUTCROP - That part of a geologic formation or structure that appears at the surface of the Earth; also, bedrock that is covered only by surficial deposits such as alluvium.

PARK - An area of public land known for its natural scenery and preserved for public recreation by a State or national government.

PEAT - An unconsolidated deposit of semicarbonized plant remains in a water-saturated environment and of persistently high moisture content (at least 75%).

PEBBLE - A rock fragment larger than a granule and smaller than a cobble; having the diameter in range of 4-64 mm (1/6 to 2.5 in).

PERCHED GROUNDWATER - Unconfiend groundwater separated from an underlying main body of ground-water by an unsaturated zone.

PERCHED WATER - See PERCHED GROUNDWATER.

PERMAFROST - Any soil, subsoil, or other surficial deposit, or even bedrock occurring in arctic, subarctic and alpine regions at a variable depth beneath the Earth's surface in which a temperature below freezing has existed continuously for a long time.

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

POLYCHLORINATED BIPHENYLS (PCBs) - A family of aromatic hydrocarbons in which chlorine atoms have replaced the hydrogen atoms in biphenyl rings. At least 100 different compounds are known as PCBs; these differ in their toxic effects as well as in their chemical and physical properties. PCBs were widely used as insulating fluids in electrical transformers and capacitors.

POLYTRICHUM MOSS - Class Musci of a very small, green, bryophytic plant having stems with leaflike structures and growing in velvety clusters on rocks, trees, and moist ground.

POND - A natural body of standing fresh water occupying a small surface depression, usually smaller than a lake and larger then a pool.

POTENTIAL EVAPOTRANSPIRATION - Amount of evaporation that would occur from a well watered lawn of 1" in height, so the amount of evapotranspiration is approximately equal to mean lake evaporation.

PRESERVE - An area maintained and protected especially for regulated hunting and fishing.

PRISTINE - Something that is still pure or untouched; uncorrupted; unspoiled.

QUATERNARY - The second period of the Cenozoic era, following the Tertiary: it began 3 to 2 million years ago and extends to the present.

RECHARGE AREA - An area in which water is absorbed that eventually reaches the zone of saturation in one or more aquifers.

RIVER - A general term for a natural freshwater surface stream of considerable volume and a permanent or seasonal flow, moving in a definite channel toward a sea, lake, or another river.

SANDY SILT - An unconsolidated sediment containing 10-50% sand and having a ratio of silt to clay greater than 2:1.

SANGAMON - Pertaining to the third classical interglacial stage of the Pleistocene Epoch in North America, after the Illinoian and before the Wisconsinan.

SEDGE - Any of the family (Cyperaceae) of grasslike plants often found on wet ground or in water, having usually triangular, solid stems, three rows of narrow pointed leaves, and minute flowers borne in spikelets.

SEDIMENT - (a) Solid fragmental material that originates from weathering of rocks and is transported or deposited by air, water, or ice, or that accumulates by other natural agents, such as chemical precipitation from solution or secretion by organisms, and that forms in layers on the Earth's surface at ordinary temperatures in a loose, unconsolidated form; (b) strictly solid material that has settled down from a state of suspension in a liquid.

SHRUB - A low, woody plant with several permanent stems instead of a single trunk.

SILT [geol] - A rock fragment or detrital particle smaller than a very fine sand grain and larger than coarse clay, having a diameter in the range of 0.004 to 0.063 mm.

SILT [soil] - (a) A rock or mineral particle in the soil, having a diameter in the range 0.002-0.005 mm; (b) A soil containing more than 80% silt-size particles, less than 12% clay, and less than 20% sand.

SILT LOAM - A soil containing 50 - 88% silt, 0 - 27% clay and 0 - 50% sand.

SLOPE [geomorph] - (a) gradient. (b) The inclined surface of any part of the Earth's surface, as a hillslope.

SOIL PERMEABILITY - The characteristic of the soil that enables water to move downward through the profile. Permeability is measured as to the number of inches per hour that water moves downward through the saturated soil.

Terms describing permeability are:

Very Slow	- less than 0.06 inches per hour (less than 4.24×10^{-5} cm/sec)
Slow	- 0.06 to 0.20 inches per hour (4.24×10^{-5} to 1.41×10^{-4} cm/sec)
Moderately Slow	- 0.20 to 0.63 inches per hour (1.41×10^{-4} to 4.45×10^{-4} cm/sec)
Moderate	- 0.63 to 2.00 inches per hour (4.45×10^{-4} to 1.41×10^{-3} (cm/sec)
Moderately Rapid	- 2.00 to 6.00 inches per hour (1.41×10^{-3} to 4.24×10^{-3} cm/sec)
Rapid	- 6.00 to 20.00 inches per hour (4.24×10^{-3} to 1.41×10^{-2} cm/sec)
Very Rapid	- more than 20.00 inches per hour (more than 1.41×10^{-2} cm/sec)

(Reference: U.S.D.A. Soil Conservation Service)

SOIL REACTION - The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests at pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as:

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4

	pH
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

SOIL STRUCTURE - The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are -- platty (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

SPHAGNUM MOSS - Class Musci of a very small, green, bryophytic plant having stems with leaflike structures and growing in velvety clusters on rocks, trees, and moist ground.

STAGE [hydraul] - The height of a water surface above an arbitrarily established datum plane.

STATIC LEVEL - That water level of a well that is not being affected by withdrawal of groundwater.

SURFACE WATER - All water exposed at the ground surface, including streams, rivers, ponds, and lakes.

TERRACE [geomorph] - Any long, narrow, relatively level or gently inclined surface, generally less broad than a plain, bounded along one edge by a steeper descending slope and along the other by a steeper ascending slope.

TERRACE [soil] - A horizontal or gently sloping ridge or embankment of earth built along the contours of a hillside for the purpose of conserving moisture, reducing erosion, or controlling runoff.
THAW LAKE - [glacial] - A pool formed on the surface of a large glacier by accumulation of meltwater.

THREATENED SPECIES - Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

TIDE - The rhythmic, alternate rise and fall of the surface of the ocean and of bodies of water connected with the ocean such as estuaries and gulfs.

TOPOGRAPHY - The general conformation of a land surface, including its relief and the position of its natural and man-made features.

TOXICITY - The degree of intensity of a poison; toxicity can be evaluated using the rating scheme of Sax (1984):
Sax's Toxicity Ratings
0 = no toxicity (None)
Substances that cause no harm under any conditions or substances that cause toxic effects under the most unusual conditions or by overwhelming doses.

1 = slight toxicity (Low)
Substances that produce changes in the human body which are readily reversible and which will disappear following termination of exposure.

2 = moderate toxicity (Moderate)
Substances that may produce irreversible as well as reversible changes in the human body. These changes are not of such severity as to threaten life or to produce serious physical impairment.

3 = severe toxicity (High)
Substances that produce irreversible changes in the human body. These changes are of such severity as to threaten human life or cause death.

TRIBUTARY - A stream feeding, joining, or flowing into a larger stream or into a lake.

VOLCANIC CONE - A conical hill of lava and/or pyroclastics that is built up around a volcanic vent.

WATER TABLE - The surface between the zone of saturation and the zone of aeration; that surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere.

WETLANDS [EPA] - Marshes, swamps, bogs, and other low-lying areas, which during some period of the year will be covered in part by natural nonflood waters.

WETLANDS - Are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of the Classification of Wetlands and Deepwater Habitats of the United States, wetlands must have one or more of the following three attributes: (1) at least periodically , the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.

WILDERNESS AREA - An area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this chapter of the Wilderness Act, an area of underdeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or an primitive and unconfined type of recreation; (3) has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic or historical value.

WISCONSINAN - Pertaining to the classical fourth glacial stage of Pleistocene epoch in North America.

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1. Department of the Interior List of Geological Survey Geologic and Water Supply Reports and Maps for Alaska. Department of the Interior. December 1986.

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5. LeFrancois, T.D. The Alaska Cleanup Effort Plan. U.S. Air Force Headquarters Alaskan Air Command, Directorate of Programs and Environmental Planning. 1985.

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7. Miller, J.F. "Probable Maximum Precipitation and Rainfall-Frequency Data for Alaska." Technical Paper No. 47 Cooperative Studies Section. Hydrologic Services Division. U.S. Weather Bureau. Washington, D.C. 1963.

8. National Oil and Hazardous Waste Contingency Plan. 47 Federal Register 31224-31235. 16 July 1982.

9. Patric, J.H. and P.E. Black. "Potential Evapotranspiration and Climate in Alaska by Thornthwaites Classification." Forest Service Research Paper PNW71. Pacific Northwest Forest and Range Experiment Station. Department of Agriculture. Forest Service. Juneau, Alaska. 1968.

10. Pewe, T.L. Quaternary Geology of Alaska. U.S. Geological Survey, Professional Paper 835. 1975.

11. Reynolds, G.L. Historical Overview and Inventory: White Alice Communications System. U.S. Army Corps of Engineers, Alaska District. April, 1988.

12. University of Alaska Mineral Terrains of Alaska. Arctic Environmental Information and Data Center. 1982.

13. Williams, John R. "Ground Water in the Permafrost Regions of Alaska." Geological Survey Professional Paper 696. U.S. Government Printing Office. Washington, D.C. 1970.

APPENDIX A

RESUMES OF PRELIMINARY ASSESSMENT TEAM MEMBERS

NATASHA M. BROCK

EDUCATION

Graduate work, civil/environmental engineering, University of Maryland, 1987-present
Graduate work, civil/environmental engineering, University of Delaware, 1985-1986
B.S. (cum laude), environmental science, University of the District of Columbia, 1984
Undergraduate work, biology, The American University, 1978-1980

CERTIFICATION

Health & Safety Training Level C

EXPERIENCE

Three years' experience in the environmental and hazardous waste field. Work performed includes remedial investigations/feasibility studies, RCRA facility assessments, comprehensive monitoring evaluations, and remedial facility investigations. Helped develop and test biological and chemical processes used in minimization of hazardous and sanitary waste generation. Researched multiple substrate degradation using aerobic and anaerobic organisms.

EMPLOYMENT

Dynamac Corporation (1987-present): Environmental Scientist

In working for Dynamac's Hazardous Materials Technical Center (HMTC), performs Preliminary Assessments, Remedial Investigations and Feasibility Studies (PA/RI/FS) under the Air National Guard Installation Restoration Program. Specifically involved in determining rates and extent of contamination, recommending groundwater monitoring procedures, and soil sampling and analysis procedures. In the process of preparing standard operating procedure manuals for quick remedial response to site spills and releases, and PA/RI/FS.

C.C. Johnson & Malhotra, P.C. (1986-1987): Environmental Scientist

Involved as part of a team in performing Remedial Investigations/Feasibility Studies (RI/FS) for EPA Regions I and IV under Resource Conservation and Recovery Act (RCRA) work assignments for REM II projects. Participated on a team involved in RCRA Facility Assessments (RFAs), Comprehensive Monitoring Evaluations (CMEs), and Remedial Facility Investigations (RFIs) for EPA work assignments under RCRA for REM III projects in Regions I and IV. Work included solo oversight observations of field sampling and facility inspections. Additional responsibilities included promotion work, graphic layout, data entry-quality check for various projects. Certified Health & Safety Training Level C.

Work Force Temporary Services (1985-1986): Research Scientist

In working for DuPont's Engineering Test Center, helped in the development and testing of laboratory-scale biological and chemical processes for a division whose main purpose was to reduce the amount of hazardous waste generated. Also worked for Hercules, Inc., with a group involved in polymer use for wastewater treatment for clients in various industrial fields. Specifically involved in product consultation, troubleshooting, and product development.

National Oceanic and Atmospheric Administration (1982-1984): Research Assistant

Involved with an information gathering and distribution center of weather impacts worldwide. Specifically involved in data collection, distribution of data to clients, assessment production and special reports.

RAYMOND G. CLARK, JR.

EDUCATION

Completed graduate engineering courses, George Washington University, 1957
B.S., Mechanical Engineering, University of Maryland, 1949

SPECIALIZED TRAINING

Grad. European Command Military Assistance School, Stuttgart, 1969
Grad. Army Psychological Warfare School, Fort Bragg, 1963
Grad. Sanz School of Languages, D.C., 1963
Grad. DOD Military Assistance Institute, Arlington, 1963
Grad. Defense Procurement Management Course, Fort Lee, 1960
Grad. Engineer Officer's Advanced Course, Fort Belvoir, 1958

CERTIFICATIONS

Registered Professional Engineer: Kentucky (#4341); Virginia (#8303); Florida (#36228)

EXPERIENCE

Thirty-one years of experience in engineering design, planning and management including construction and construction management, environmental, operations and maintenance, repair and utilities, research and development, electrical, mechanical, master planning and city management. Over six years' logistical experience including planning and programming of military assistance materiel and training for foreign countries, serving as liaison with American private industry, and directing materiel storage activities in an overseas area. Over two years' experience as an engineering instructor. Extensive experience in personnel management, cost reduction programs, and systems improvement.

EMPLOYMENT

Dynamac Corporation (1986-present): Program Manager/Department Manager

Responsible for activities relating to Preliminary Analysis, Site Investigations, Remedial Investigations, Feasibility Studies, and Remedial Action for the Installation Restoration Program for the U.S. Air Force, Air National Guard, Bureau of Prisons, and the U.S. Coast Guard, including records search, review and evaluation of previous studies; preparation of statements of work, feasibility studies; preparation of remedial action plans, designs and specifications; review of said studies/plans to ensure that they are in conformance with requirements; review of environmental studies and reports; preparation of Air Force Installation Restoration Program Management Guidance; and preparation of Part B permits.

Howard Needles Tammen & Bergendoff (HNTB) (1981-1986): Manager

Responsible, as Project Manager, for: design of a new concourse complex at Miami International Airport to include terminal building, roadway system, aircraft apron, drainage channel relocation, satellite building with underground pedestrian tunnel, and associated underground utility corridors, to include subsurface aircraft fueling systems, with an estimated construction cost of $163 million; a cargo vehicle tunnel under the crosswind runway with an estimated construction cost of $15 million; design and construction of two large corporate jet aircraft hangars; and for the hydrocarbon recovery program to include investigation, analysis, design of recovery systems, monitoring of recovery systems, and planning and design of residual recovery systems utilizing biodegradation. Participated, as sub-consultant, in Air Force IRP seminar.

HNTB (1979-1981): Airport Engineer

Responsibilities included development of master plan for Iowa Air National Guard base; project initiation assistance for a new regional airport in Florida; engineering assistance for new facilities design and construction for Maryland Air National Guard; master plan for city maintenance facilities, Orlando, Florida; in-country master plan and preliminary engineering project management for Madrid, Spain, International Airport; and project management of master plan for Whiting Naval Air Station and outlying fields in Florida.

HNTB (1974-1979): Design Engineer

Responsibilities included development of feasibility and site selection studies for reliever airports in Cleveland and Atlanta; site selection and facilities requirements for the Office of Aeronautical Charting and Cartography, NOAA; and onsite mechanical and electrical engineering design for terminal improvements at Baltimore-Washington International Airport, Maryland.

HNTB (1972-1974): Airport Engineer

Responsible for development of portions of the master plan and preliminary engineering for a new international airport for Lisbon, Portugal, estimated to cost $250 million.

Self-employed (1971-1972): Private Consultant

Responsible for engineering planning and installation of a production line for multimillion-dollar contract in Madrid, Spain, to fabricate transmissions and differentials for U.S. Army vehicles.

U.S. Army, Corps of Engineers (1969-1971): Chief, Materiel & Programs

Directed materiel planning and military training programs of military assistance to the Spanish Army. Controlled arrival and acceptance of materiel by host government. Served as liaison/advisor to American industry interested

in conducting business with Spanish government. Was Engineer Advisor to Spanish Army Construction, Armament and Combat Engineers, also the Engineer Academy and Engineer School of Application.

Corps of Engineers (1968-1969): Chief, R&D Branch, OCE

Directed office responsible to Chief of Engineers for research and development. Developed research studies in new concepts of bridging, new explosives, family of construction equipment, night vision equipment, expedient airfield surfacing, expedient aircraft fueling systems, water purification equipment and policies, prefabricated buildings, etc. Achieved Department of Army acceptance for development and testing of new floating bridge. Participated in high-level Department Committee charged with development of a Tactical Gap Crossing Capability Model.

Corps of Engineers (1967-1968): Division Engineer

Facilities engineer in Korea. Was fully responsible for management and maintenance of 96 compounds within 245 square miles including 6,000+ buildings, 1 million linear feet of electrical distribution lines, 18 water purification and distribution systems, sanitary sewage disposal systems, roads, bridges, and fire protection facilities with real property value of more than $256 million. Planned and developed the first five-year master plan for this area. Administered $12 million budget and $2 million engineer supply operation. Was in responsible charge of over 500 persons. Developed and obtained approval for additional projects worth $9 million for essential maintenance and repair. Directed cost reduction programs that produced more than $500,000 savings to the United States in the first year.

Corps of Engineers (1963-1967): Engineer Advisor

Engineer and aviation advisor to the Spanish Army. Developed major modernization program for Spanish Army Engineers, including programming of modern engineer and mobile maintenance equipment. Directed U.S. portion of construction, testing and acceptance of six powder plants, one shell loading facility, an Engineer School of Application, and depot rebuild facilities for engineer, artillery, and armor equipment. Planned and developed organization of a helicopter battalion for the Spanish Army. Responsible for sales, delivery, assembly and testing of 12 new helicopters in country. Provided U.S. assistance to unit until self-sufficiency was achieved. Was U.S. advisor to Engineer Academy, School of Application and Polytechnic Institute.

Corps of Engineers (1960-1963): Deputy District Engineer

Responsible for planning and development of extensive construction projects in the Ohio River Basin for flood control and canalization, including dam, lock, bridge, and building construction, highway relocation, watershed studies, real estate acquisitions and dispositions. Was contracting officer for more than $75

million of projects per year. Supervised approximately 1,300 personnel, including 300 engineers. Planned and directed cost reduction programs amounting to more than $200,000 per year. Programmed and controlled development of a modern radio and control net in a four-state area.

Corps of Engineers (1959-1960): Area Engineer

Directed construction of a large airfield in Ohio as Contracting Officer's representative. Assured that all construction (runway, steam power plant, fuel transfer and loading facilities, utilities, buildings, etc.) complied with terms of plans and specifications. Was onsite liaison between Air Force and contractors.

Corps of Engineers (1958-1959): Chief, Supply Branch

Managed engineer supply yard containing over $21 million construction supplies and engineer equipment. Directed in-storage maintenance, processing and deprocessing of equipment. Achieved complete survey of items on hand, a new locator system and complete rewarehousing, resulting in approximately $159,000 savings in the first year.

Corps of Engineers (1957-1958): Student

U.S. Army Engineer School, Engineer Officer's Advanced Course.

Corps of Engineers (1954-1957): Engineer Manager

Managed engineer construction projects and was assigned to staff and faculty of the Engineer School. Was in charge of instruction on engineer equipment utilization, management and maintenance. Directed Electronic Section of the school. Coordinated preparation of five-year master plan for the Department of Mechanical and Technical Equipment.

Corps of Engineers (1949-1954): Engineer Commander

Positions of minor but increasing importance and responsibility in engineering management, communications, demolitions, construction administration and logistics.

PROFESSIONAL AFFILIATIONS

Member, National Society of Professional Engineers
Fellow, Society of American Military Engineers
Member, American Society of Civil Engineers
Member, Virginia Engineering Society
Member, Project Management Institute

HARDWARE

IBM PC

SOFTWARE

Lotus 1-2-3, D Base III Plus, Framework, Project Scheduler 5000, Harvard Project Manager, Volkswriter, Microsoft Project

MARK D. JOHNSON

EDUCATION

B.S., Geology, James Madison University, 1980

EXPERIENCE

Eight years' technical and management experience including geologic mapping, subsurface investigations, foundation inspections, groundwater monitoring, pumping and observation well installation, geotechnical instrumentation, groundwater assessment, preparation of Air Force Installation Restoration Program Guidance, preparation of statements of work for environmental field monitoring and feasibility studies for the Air Force and the Air National Guard, development of environmental field monitoring programs, and preparation of Preliminary Assessments for the Air National Guard.

EMPLOYMENT

Dynamac Corporation (1984-present): Senior Staff Scientist/Geologist

Primarily responsible for developing and managing technical support programs relevant to CERCLA related activities for the Air Force, Air National Guard, Department of Justice and Coast Guard. These activities include Statements of Work for Site Investigations (SI), Remedial Investigations (RI), and Feasibility Studies (FS); assessing groundwater at hazardous waste disposal/spill sites for the purpose of determining rates and extents of contaminant migration and for developing SI and RI programs and identifying remedial actions; reviewing SI, RI and FS contractor work plans for various government clients, developing technical and contractual requirements for SI, RI and FS projects, managing the development and preparation of Preliminary Assessments, and assisting clients in the development of their environmental management programs, which included preparation of the Air Force's Installation Restoration Program Management Guidance document.

Bechtel Associates Professional Corporation (1981-1984): Geologist

Performed the following duties in conjunction with major civil engineering projects including subways, nuclear power plants and buildings: prepared geologic maps of surface and subsurface facilities in rock and soil including tunnels, foundations and vaults; assessed groundwater conditions in connection with construction activities and groundwater control systems; monitored the installation of permanent and temporary dewatering systems and observation wells; monitored surface and subsurface settlement of tunnels; and participated in subsurface investigations.

Schnabel Engineering Associates (1981): Geologist

Inspected foundations and backfill placement.

PROFESSIONAL CREDENTIALS

Registered Professional Geologist, South Carolina, #116, 1987

PROFESSIONAL AFFILIATIONS

Association of Engineering Geologists
National Water Well Association/Association of Ground Water Scientists and Engineers

BETSY A. BRIGGS

EDUCATION

B.S., Biology and Chemistry, State University College of New York at Cortland, 1979
Completed several courses in M.B.A. program, University of Phoenix, Denver, Colorado Division, 1984

SPECIALIZED TRAINING

Hazardous Waste Management course, Air Force Institute of Technology, 1986

CERTIFICATION

Certified Hazardous Materials Manager, Institute of Hazardous Materials Management, 1985

SECURITY CLEARANCE

Secret/DOE

EXPERIENCE

Nine years of experience including three years in hazardous waste management, two years as an environmental engineer, two years as an ecologist, and two years in laboratory research. Has conducted ambient air quality monitoring programs, critical pathways projects to study movement of radioactive materials in the environment, metallurgic laboratory analyses, and independent studies in biology and chemistry. Currently provides managerial oversight and technical support to a hazardous waste program for the Air Force.

EMPLOYMENT

Dynamac Corporation (1985-present): Program Manager/Hazardous Waste Specialist

Primary responsibility as program manager is to oversee and manage up to 44 field personnel involved in RCRA and CERCLA work in support of the U.S. Air Force. Other duties include performing preliminary assessments/site surveys for the Air National Guard, marketing and proposal preparation, and preparing and providing training in preparation for the Certified Hazardous Materials Manager examination.

As hazardous waste specialist the primary responsibility was to manage the hazardous waste program at Myrtle Beach Air Force Base. Duties included:

- o Reviewing the design and specifications of various base construction projects and overseeing such projects to ensure compliance with all applicable state and federal hazardous waste regulations. Projects under design included a corrosion control facility, TSD facility, two accumulation points, and a parts cleaning vat system. Construction project oversight included the final inspection of the entomology building to ensure that the facility was equipped for proper storage, usage and disposal of pesticides; removal of materials contaminated with pesticides, PCBs, petroleum products, and solvents from six sites; asbestos removal and disposal from a former hangar site; and the removal of two underground storage tanks, one of which was leaking.
- o Conducting surveys of hazardous waste generating activities.
- o Advising on need for and methods of minimizing hazardous waste generation.
- o Writing and maintaining hazardous waste management plan.
- o Preparing hazardous waste management reports and documents required by state and federal law.
- o Maintaining liaison with federal and state regulatory agencies on matters involving criteria, standards, performance specifications, and monitoring.
- o Providing information and technical consultation to Air Force installation staff regarding hazardous materials and hazardous waste operations.
- o Serving as ad hoc advisor to environmental contingency response teams.

Rockwell International (1982-1984): Environmental Engineer

Primary responsibility was collection, evaluation, and reporting of ambient air monitoring data. Other responsibilities included technical assistance for monitoring total suspended solids in ambient air. Also performed data collection and reduction of air effluent emission control activities.

Environmental monitoring and control programs are to ensure that all Department of Energy and other governmental effluent regulations are met, and that plant effluents are consistent with the As Low As Reasonably Achievable (ALARA) Principle. Monthly and Annual Reports summarize the effluent and environmental monitoring programs.

Rockwell International (1980-1982): Ecologist

Responsible for planning, organizing, and leading critical pathways projects designed to study the movement of radioactive materials throughout the environment. Projects were: (1) general critical pathway evaluation to identify

sampling points possibly not considered in present monitoring program; (2) plant uptake versus plant uptake plus foliar deposition measurement study; (3) deer tissue analysis program; and (4) food stuff monitoring program. Progress and results were published in semiannual reports.

Colorado School of Mines Research Institute, Texas Gulf Research Laboratory (1979-1980): Senior Laboratory Technician

Work involved quantitative analysis of platinum, palladium, and silver in soil samples. Analysis included sample preparation, fire assays, calorimetric procedures, and smelt tests.

State University College of New York at Cortland (1978-1979): Undergraduate Independent Study

Project involved the isolation of trail pheromone from spun silk of *Hyphantria* (fall webworm). Included organic and inorganic extraction procedures and performing bioassays. Also worked on production of synthetic diet comparable to fresh leaf diet for *Malacosoma* (eastern tent caterpillar).

PUBLICATIONS

Hazardous Waste Management Survey for Myrtle Beach Air Force Base, Hazardous Materials Technical Center, Rockville, Maryland, 1986 and 1988.

Hazardous Waste Management Plan for Myrtle Beach Air Force Base, Hazardous Materials Technical Center, Rockville, Maryland, 1987 and 1988.

Waste Minimization Guidance for Myrtle Beach Air Force Base, Hazardous Materials Technical Center, Rockville, Maryland, 1988.

Underground Storage Tank Management Plan for Myrtle Beach Air Force Base, Hazardous Materials Technical Center, Rockville, Maryland, 1988.

Annual Environmental Monitoring Report, Rockwell International, Energy Systems Group, Rocky Flats Plant, 1982 and 1983.

Environmental Studies Group Semiannual Report, Rockwell International, Energy Systems Group, Rocky Flats Plant, June/December of 1980 and 1981.

TECHNICAL PRESENTATIONS

PCB Management, Myrtle Beach Air Force Base, 1987.

Underground Storage Tank Regulations/History, Myrtle Beach Air Force Base, 1986.

Overview of the Hazardous Waste Training Program, Myrtle Beach Air Force Base, 1985.

Overview of the Environmental Studies Group, Nevada Test Site and Rockwell International at Hanford, Washington, 1981.

JANET SALYER EMRY

EDUCATION

M.S., geology, Old Dominion University, 1987
B.S. (cum laude), geology, James Madison University, 1983

EXPERIENCE

Three years' technical experience in the fields of hydrogeology and environmental science, including drilling and placement of wells, well monitoring, aquifer testing, determination of hydraulic properties, computer modeling of aquifer systems, and field and laboratory soils analysis.

EMPLOYMENT

Dynamac Corporation (1987-present): Staff Scientist/Hydrogeologist

Responsibilities include Preliminary Assessments, Site Investigations, Remedial Investigations, Feasibility Studies, and Emergency Responses to include providing geological and hydrological assessments of hazardous waste disposal/spill sites, determination of rates and extents of contaminant migration, and computer modeling of groundwater flow and contaminant transport. Projects are for the U.S. Air Force and Air National Guard Installation Restoration Program.

Froehling and Robertson, Inc. (1986-1987): Geologist/Engineering Technician

Performed both field and laboratory engineering soils tests.

The Nature Conservancy (1985-1986): Hydrogeologist

Investigated groundwater geology of the Nature Conservancy's Nags Head Woods Ecological Preserve in Dare County, North Carolina. Study included installing wells, monitoring water table levels, determination of hydraulic parameters through a pumping test, stratigraphic test borings, and computer modeling.

Old Dominion University (1983-1985): Teaching Assistant, Department of Geological Sciences

Taught laboratory classes in Earth Science and Historical Geology.

PROFESSIONAL AFFILIATIONS

Geological Society of America
National Water Well Association/Association of Ground Water Scientists and Engineers

PUBLICATION

Impact of Municipal Pumpage Upon a Barrier Island Water Table, Nags Head and Kill Devil Hills, North Carolina. In: Abstracts with Programs, Geological Society of America, Vol. 19, No. 2, February 1987.

LAWRENCE E. GLADSTONE

EDUCATION

B.S., Geophysics, Virginia Polytechnic Institute & State University, 1985

EXPERIENCE

Two years' experience as junior staff scientist for the Hazardous Materials Technical Center of Dynamac Corporation. Experience in hazardous waste management includes conducting Phase I records searches for the Air National Guard's Installation Restoration Program, auditing records of waste management firms awarded disposal contracts by DoD, and preparing RCRA Part B permit applications for the Defense Reutilization and Marketing Service (DRMS).

EMPLOYMENT

Dynamac Corporation (1986-present): Junior Staff Scientist

Performs preliminary assessments of suspected hazardous waste sites at Air National Guard bases under Phase I of the Installation Restoration Program. Duties include searching available records, interviewing past and present employees, observing current waste management practices, and investigating identified spill/disposal sites.

Prepares RCRA Part B permits for hazardous waste storage facilities operated by DRMS.

Prepared Air Force's response to EPA CERCLA 104(e) letters regarding wastes generated by Luke and Altus Air Force Bases which may have been disposed at landfill facilities subsequently identified as Superfund sites requiring remedial action.

Developed closure maintenance plans for landfill cells at Edwards Air Force Base.

Conducted surveillance of hazardous waste contractors for DRMS. Responsibilities included auditing waste records, tracking fate of disposed items, and monitoring contractor operations.

Assisted in development of data base designed to reveal disposal costs of waste generated at Defense Reutilization and Marketing Offices.

U.S. Geological Survey (part-time, 1983-1985): Cartographic Aide

Assisted in quality control process of printing and distributing 7-1/2 minute topographic maps. Checked and corrected map separate registration, organized negative and positive overlays for alignment, and prepared photographic service requests.

DAVID R. HALE

EDUCATION

B.S., Civil Engineering, Virginia Polytechnic Institute, 1978

SPECIALIZED TRAINING

Groundwater Remediation Course, National Water Well Association, 1986
Contract Supervisor School, CBI Industries, 1981

CERTIFICATION

Engineer-in-Training Certificate, State of Virginia, 1978

EXPERIENCE

Ten years' experience in a wide variety of engineering planning, design and management, environmental assessment and remediation, project and construction management, as well as research and development activities related to new and innovative technologies. Experience includes involvement in small-, medium- and large-scale environmental and civil projects, and includes project conception, design, implementation, construction and management activities. Extensive experience in the development, design and management of projects involving several interdisciplinary fields of engineering, sciences, and business. Proficiency in a wide variety of computer systems and usage, including mainframe and microcomputers as well as CAD systems.

EMPLOYMENT

Dynamac Corporation (1987-present): Manager of Engineering

Responsible for the engineering management of various environmental consulting engineering and technical services in the Dayton regional office. Responsibilities include the planning, development, and execution of engineering and technical services for environmental projects such as hazardous waste site investigations and remediation, asbestos assessment and abatement, RCRA permitting, monitoring and compliance, industrial hygiene and training, as well as other environmental matters.

DETOX, Inc. (1986): Manager, Technical Services

Responsible for the overall development, design, project management and implementation of various groundwater remediation projects, as well as several specialized wastewater treatment systems. Heavy emphasis on the conceptual development and design engineering related to innovative biological treatment techniques, equipment and systems, as well as multiunit process water and

wastewater treatment systems. Staff management responsibilities included supervision of engineering, procurement, and large-scale project management functions, as well as direct involvement in project marketing, corporate computer and CAD operations, and company R&D efforts.

DETOX, Inc. (1985-1986): Eastern Regional Manager

As regional manager for the eastern United States, responsibilities included the overall marketing, sales, and project management for groundwater remediation and industrial wastewater projects in this area. Efforts resulted in establishing a widespread customer interest base for the groundwater treatment equipment and technical services offered by DETOX, as well as sale and management of several substantial and innovative remediation projects. Instituted corporatewide microcomputer-based CAD and project management systems.

CBI Industries, Inc. (1981-1985): Project Engineer

As part of a new Water Technology Development venture group (1984-1985), involved in actively researching, seeking, and implementing for CBI new and innovative technologies and business lines. Responsibilities included acquisition research, engineering and financial analysis and assessment, market research, and business development. Two new business line developments resulted in $15 million to $20 million in annual revenues. Actively pursued several new business areas for CBI, including the privitization of municipal water and wastewater facilities, and sewage sludge composting. Initiated CBI interest in co-development of a new, innovative flue gas treatment technology for reducing acid-rain-causing emissions from fossil fuel combustion processes. Awarded one patent, with two pending applications, as a result of activities in the Water Technology group.

Project engineer assigned to various CBI Industries engineering departments (Special Structures, Standard Structures, and Marine Structures) (1981-1984); involved in the design and analysis of several substantial projects. These included the conception and design of two new and innovative offshore oil exploration drilling structures for use in Alaskan Arctic waters, with a patent award for one concept. Responsible for the external structural analysis and design on CBI's largest ever project, a turnkey LGN/LPG facility in excess of $350 million.

CBI Industries, Inc. (1979-1981): Project Engineer/Field Engineer

Assigned to CBI's Saudi Arabian construction subsidiary (Arabian CBI); worked as project and field engineer on several substantial field construction projects, including two refinery tankage terminals (a total of 120 petroleum tanks) and several refinery vessels and miscellaneous structures. Involved in the day-to-day management of large-scale field construction projects, including the close supervision and management of large numbers of field employees from several diverse nationalities. Responsible for the field engineering aspects of large petrochemical projects, including field layout, surveying, and erection supervision.

CBI Industries, Inc. (1978-1979): Engineer Trainee

Worked at CBI's Delaware Engineering Office and Pennsylvania Manufacturing Plant as part of CBI's Engineer Advancement Program. Duties included familiarization with CBI procedures related to detail engineering and manufacturing, as well as hands-on training in such areas as welding, fabrication, and engineering drawing.

PUBLICATIONS

Hale, D.R., and E.K. Nyer. 1986. Two Years of Operation of a Groundwater Treatment System, Proceedings of the 1986 ASCE National Conference on Environmental Engineering.

Hale, D.R., et al. Physical/chemical in-situ treatment techniques. Chapter 10 in: In-situ Treatment Technology (in press).

TECHNICAL PRESENTATIONS

Instructor on Groundwater Treatment Technology, 1986 Aquifer Remediation Course Series presented by the National Water Well Association

Instructor on Groundwater Treatment Technology, 1986 HazPro Professional Certification Symposium

APPENDIX B

OUTSIDE AGENCY CONTACT LIST

OUTSIDE AGENCY CONTACT LIST

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3601 C Street, Suite 1350
Anchorage, AK 99508
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Arctic Environmental Information and Data Center
University of Alaska
707 A Street
Anchorage, AK 99501
(907) 257-2733

National Oceanic and Atmospheric Administration
Office of Hydrology
Grammax Building
8060 13th Street
Silver Spring, MD 20910
(301) 427-7543

National Oceanic and Atmospheric Administration
701 C Street, Box 38
Anchorage, AK 99513
(907) 271-5040

State of Alaska Department of Natural Resources
Division of Geological and Geophysical Surveys
3700 Airport Way
Fairbanks, AK 99709-4609
Mark Robinson (907) 474-7147

U.S. Fish and Wildlife Services
1011 East Tudor Road
Anchorage, AK
Ronald Garrett, (907) 786-3435

U.S. Fish and Wildlife Service
1412 Airport Way
Fairbanks, AK 99701-8524
R.E. (Skip) Ambrose, (907) 456-0239

U.S. Geological Survey
12201 Sunrise Valley Drive
Reston, VA 22092

U.S. Geological Survey
4200 University Drive
Anchorage, AK 99508
Oscar J. Ferrians, Jr., (907) 561-1181

U.S. Soil Conservation Service
201 East 9th Avenue, Suite 300
Anchorage, AK
(907) 271-2424

APPENDIX C

USAF HAZARD ASSESSMENT RATING METHODOLOGY

USAF HAZARD ASSESSMENT RATING METHODOLOGY

The Department of Defense (DoD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DoD facilities. One of the actions required under this program is to:

> develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Preliminary Assessment phase of its Installation Restoration Program (IRP).

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air National Guard in setting priorities for follow-on site investigations.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD program needs.

The model uses data readily obtained during the Preliminary Assessment portion of the IRP. Scoring judgment and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards. This approach meshes well with the policy for evaluating and setting restrictions on excess DoD properties.

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure 1 of this report). The site rating form and the rating factor guideline are provided at the end of this appendix.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: possible receptors of the contamination, the waste and its characteristics, the potential pathways for contaminant migration, and any efforts that were made to contain the wastes resulting from a spill.

The receptors category rating is based on four rating factors: the potential for human exposure to the site, the potential for human ingestion of contaminants should underlying aquifers be polluted, the current and anticipated uses of the surrounding area, and the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1,000 feet of the site, and the distance between the site the the base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within 3 miles of the site. The uses of the surrounding area are determined by the zoning within a 1-mile radius. Determination of whether or not critical environments exist within a 1-mile radius of the site predicts the potential for adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (0-3) and increased by a multiplier. The maximum possible score is also computed. The factor score and maximum possible scores are totaled, and the receptors subscore computed as follows: receptors subscore = (100 x factor score subtotal/maximum score subtotal).

The waste characteristics category is scored in three stages. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways: surface-water migration, flooding, and groundwater migration. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned, and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among the three possible routes is used. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The scores for each of the three categories are added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites with no containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

APPENDIX D

USAF HAZARD ASSESSMENT RATING GUIDELINES, FACTOR RATING CRITERIA, AND SITE HAZARDOUS ASSESSMENT RATING FORMS

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; proserved areas; presence or economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground-water use of uppermost aquifer	Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-50	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records
- o Knowledge of types and quantities of wastes generated by shops and other areas on base

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records

Logic based on the knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Factors	Rating Scale Levels			
	0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200° F	Flash point at 140° F to 200° F	Flash point at 80° F to 140° F	Flash point less than 80° F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
	L	C	M
80	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
	L	S	M
50	L	C	L
	M	S	H
	S	C	M
	S	S	H
40	M	S	M
	M	C	L
	L	S	L
	S	C	L
30	M	S	L
	S	S	M
20	S	S	L

Notes:

For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level

- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels.

Waste Hazard Rating

- o Wastes with the same hazard rating can be added.
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Multiply Point Rating Persistence Criteria	From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (including drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay (>10^{-2} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay (<10^{-6} cm/sec)	6
Rainfall intensity based on 1-year 24-hour rainfall (Number of thunderstorms)	<1.0 inch (0-5)	1.0 to 2.0 inches (6-35)	2.1 to 3.0 inches (36-49)	>3.0 inches (>50)	8

B-2 Potential for Flooding

Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Ground-Water Contamination

Depth to groundwater	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	8
Soil permeability	Greater than 50% clay (<10^{-6} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay (>10^{-2} cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8

B 5 Potential for Ground-Water Contamination -Continued

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Direct access to groundwater (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-8-1, or III-6-3, then leave blank for calculation of factor score and maximum possible score.

Bethel Radio Relay Station
Bethel, Alaska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

1. RECEPTORS CATEGORY	RATING SCALE LEVELS	NUMERICAL VALUE
Population within 1,000 feet of site:		
Site No. 1	0	0
Site No. 2	0	0
Site No. 3	0	0
Site No. 4	0	0
Site No. 5	0	0
Site No. 6	0	0
Site No. 7	0	0
Site No. 8	0	0
Site No. 9	0	0
Distance to nearest well:		
Site No. 1	1 to 3 miles	1
Site No. 2	1 to 3 miles	1
Site No. 3	1 to 3 miles	1
Site No. 4	1 to 3 miles	1
Site No. 5	1 to 3 miles	1
Site No. 6	1 to 3 miles	1
Site No. 7	1 to 3 miles	1
Site No. 8	1 to 3 miles	1
Site No. 9	1 to 3 miles	1
Land use/zoning within 1-mile radius:	Residential	3
Distance Base boundary:		
Site No. 1	0 to 1,000 feet	3
Site No. 2	0 to 1,000 feet	3
Site No. 3	0 to 1,000 feet	3
Site No. 4	0 to 1,000 feet	3
Site No. 5	0 to 1,000 feet	3
Site No. 6	0 to 1,000 feet	3
Site No. 7	0 to 1,000 feet	3
Site No. 8	0 to 1,000 feet	3
Site No. 9	0 to 1,000 feet	3

Bethel Radio Relay Station
Bethel, Alaska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

1. RECEPTORS CATEGORY	RATING SCALE LEVELS	NUMERICAL VALUE
Critical environments within 1-mile radius:	Pristine natural area; minor wetland; preserved area; or presence of economically important natural resource susceptible to contamination	2
Water quality of nearest surface water body:	Potable water supplies	3
Groundwater use of uppermost aquifer:	Drinking water, no municipal water available	3
Population served by surface water supply within 3 miles downstream of site:	0	0
Population served by groundwater supply within 3 miles of site:	Greater than 1,000	3
2. WASTE CHARACTERISTICS		
Quantity:		
Site No. 1	Small	S
Site No. 2	Small	S
Site No. 3	Small	S
Site No. 4	Small	S
Site No. 5	Small	S
Site No. 6	Small	S
Site No. 7	Small	S
Site No. 8	Small	S
Site No. 9	Small	S

Bethel Radio Relay Station
Bethel, Alaska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

2. WASTE CHARACTERISTICS (Continued)	RATING SCALE LEVELS	NUMERICAL VALUE
Confidence Level:		
Site No. 1	Confirmed	C
Site No. 2	Confirmed	C
Site No. 3	Confirmed	C
Site No. 4	Confirmed	C
Site No. 5	Confirmed	C
Site No. 6	Confirmed	C
Site No. 7	Confirmed	C
Site No. 8	Confirmed	C
Site No. 9	Suspected	S
Hazard Rating:		
Toxicity		
Site No. 1	Sax's Level 3	3
Site No. 2	Sax's Level 3	3
Site No. 3	Sax's Level 3	3
Site No. 4	Sax's Level 3	3
Site No. 5	Sax's Level 3	3
Site No. 6	Sax's Level 3	3
Site No. 7	Sax's Level 3	3
Site No. 8	Sax's Level 3	3
Site No. 9	Sax's Level 3	3
Ignitability		
Site No. 1	Flash point between 140°F and 200°F	1
Site No. 2	Flash point between 140°F and 200°F	1
Site No. 3	Flash point between 140°F and 200°F	1
Site No. 4	Flash point between 140°F and 200°F	1
Site No. 5	Flash point between 140°F and 200°F	1
Site No. 6	Flash point between 140°F and 200°F	1
Site No. 7	Flash point between 140°F and 200°F	1
Site No. 8	Flash point between 140°F and 200°F	1
Site No. 9	Flash point between 140°F and 200°F	1

Bethel Radio Relay Station
Bethel, Alaska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

2. WASTE CHARACTERISTICS (Continued)	RATING SCALE LEVELS	NUMERICAL VALUE
Radioactivity		
Site No. 1	At or below background levels	0
Site No. 2	At or below background levels	0
Site No. 3	At or below background levels	0
Site No. 4	At or below background levels	0
Site No. 5	At or below background levels	0
Site No. 6	At or below background levels	0
Site No. 7	At or below background levels	0
Site No. 8	At or below background levels	0
Site No. 9	At or below background levels	0
Persistance Multiplier:		
Site No. 1	Straight chain hydrocarbon compound	0.8
Site No. 2	Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Site No. 3	Metals, polycyclic compounds and halogenated hydrocarbons	1.0
Site No. 4	Metals, polycyclic compounds and halogenated hydrocarbons	1.0
Site No. 5	Metals, polycyclic compounds and halogenated hydrocarbons	1.0
Site No. 6	Metals, polycyclic compounds and halogenated hydrocarbons	1.0
Site No. 7	Metals, polycyclic compounds and halogenated hydrocarbons	1.0
Site No. 8	Straight chain hydrocarbon compound	0.8
Site No. 9	Metals, polycyclic compounds and halogenated hydrocarbons	1.0

Bethel Radio Relay Station
Bethel, Alaska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

2. WASTE CHARACTERISTICS (Continued)	RATING SCALE LEVELS	NUMERICAL VALUE
Physical State Multiplier:		
Site No. 1	Liquid	1.0
Site No. 2	Liquid	1.0
Site No. 3	Liquid	1.0
Site No. 4	Liquid	1.0
Site No. 5	Liquid	1.0
Site No. 6	Liquid	1.0
Site No. 7	Liquid	1.0
Site No. 8	Liquid	1.0
Site No. 9	Liquid	1.0
3. PATHWAYS CATEGORY		
Evidence of Contamination:		
Site No. 1	Indirect evidence from visual observation or reported discharges cannot be directly confirmed as resulting from the site, but the site is greatly suspected as a contamination source	80
Site No. 2	Indirect evidence from visual observation or reported discharges cannot be directly confirmed as resulting from the site, but the site is greatly suspected as a contamination source	80
Site No. 3	Indirect evidence from visual observation or reported discharges cannot be directly confirmed as resulting from the site, but the site is greatly suspected as a contamination source	80

Bethel Radio Relay Station
Bethel, Alaska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

3. PATHWAYS CATEGORY (Continued)	RATING SCALE LEVELS	NUMERICAL VALUE
Evidence of Contamination: (Continued)		
Site No. 4	Indirect evidence from visual observation or reported discharges cannot be directly confirmed as resulting from the site, but the site is greatly suspected as a contamination source	80
Site No. 5	Indirect evidence from visual observation or reported discharges cannot be directly confirmed as resulting from the site, but the site is greatly suspected as a contamination source	80
Site No. 6	Indirect evidence from visual observation or reported discharges cannot be directly confirmed as resulting from the site, but the site is greatly suspected as a contamination source	80
Site No. 7	Indirect evidence from visual observation or reported discharges cannot be directly confirmed as resulting from the site, but the site is greatly suspected as a contamination source	80
Site No. 8	Indirect evidence from visual observation or reported discharges cannot be directly confirmed as resulting from the site, but the site is greatly suspected as a contamination source	80

Bethel Radio Relay Station
Bethel, Alaska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

3. PATHWAYS CATEGORY (Continued)	RATING SCALE LEVELS	NUMERICAL VALUE
Evidence of Contamination: (Continued)		
Site No. 9	Indirect evidence from visual observation or reported discharges cannot be directly confirmed as resulting from the site, but the site is greatly suspected as a contamination source	80
Surface Water Migration:		
Distance to nearest surface water		
Site No. 1	501 to 2,000 feet	2
Site No. 2	501 to 2,000 feet	2
Site No. 3	501 to 2,000 feet	2
Site No. 4	501 to 2,000 feet	2
Site No. 5	501 to 2,000 feet	2
Site No. 6	501 to 2,000 feet	2
Site No. 7	501 to 2,000 feet	2
Site No. 8	501 to 2,000 feet	2
Site No. 9	501 to 2,000 feet	2
Net precipitation	-10 to +5 inches	1
Surface erosion	Slight	1
Surface permeability	30% to 50% clay (10^{-4} and 10^{-6} cm/sec)	2
Rainfall intensity	2.1 to 3.0 inches	2
Flooding:	Floods annually	3

Bethel Radio Relay Station
Bethel, Alaska

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

3. PATHWAYS CATEGORY (Continued)	RATING SCALE LEVELS	NUMERICAL VALUE
Groundwater Migration:		
Depth to groundwater	50 to 500 feet	1
Net precipitation		1
Soil permeability	30% to 50% clay (10^{-4} and 10^{-6} cm/sec)	1
Subsurface flow	Bottom of site greater than 5 feet above high groundwater level	0
Direct access to groundwater	No evidence of risk	0

4. WASTE MANAGEMENT PRACTICES CATEGORY		
Practice:		
Site No. 1	No containment	1.0
Site No. 2	No containment	1.0
Site No. 3	No containment	1.0
Site No. 4	No containment	1.0
Site No. 5	No containment	1.0
Site No. 6	No containment	1.0
Site No. 7	No containment	1.0
Site No. 8	No containment	1.0
Site No. 9	No containment	1.0

HAZARD ASSESSMENT RATING FORM

NAME OF SITE SITE NO. 1 - POL FACILITY
LOCATION BETHEL RADIO RELAY STATION, BETHEL ALASKA
DATE OF OPERATION/OCCURRENCE 1958 TO PRESENT
OWNER/OPERATOR ALASKA AIR COMMAND
COMMENTS/DESCRIPTION
RATED BY HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	0	4	0	12
B. DISTANCE TO NEAREST WELL	:	1	10	10	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	3	3	9	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	2	10	20	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	0	6	0	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	3	9	27	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	0	6	0	18
GROUND WATER	:	3	6	18	18
		SUBTOTALS		102	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 57

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (40)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A	x	PERSISTENCE FACTOR		SUBSCORE B
(40)	(	0.8)	=	(32)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B	x	PHYSICAL STATE MULTIPLIER		WASTE CHARACTERISTICS SUBSCORE
(32)	(	1)	=	(32)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF (100 POINTS FOR DIRECT EVIDENCE) OR (80 POINTS FOR INDIRECT EVIDENCE). IF DIRECT EVIDENCE (100) EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE (80 OR LESS) EXISTS, PROCEED TO B.

(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	2	8	16	24
SUBTOTALS				58	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					54

2. FLOODING 0 1 0 3

SUBSCORE (100 x FACTOR SCORE /3) : 0

3. GROUND WATER MIGRATION

DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.

(80)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(57)
WASTE CHARACTERISTICS	(32)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(56)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE	x	WASTE MANAGEMENT PRACTICES FACTOR	x	FINAL SCORE
(56)		(1)	=	56

HAZARD ASSESSMENT RATING FORM

NAME OF SITE: SITE NO. 2 - VEHICLE MAINTENANCE BUILDING
LOCATION: BETHEL RADIO RELAY STATION, BETHEL ALASKA
DATE OF OPERATION/OCCURRENCE: 1958 TO PRESENT
OWNER/OPERATOR: ALASKA AIR COMMAND
COMMENTS/DESCRIPTION:
RATED BY: HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	0	4	0	12
B. DISTANCE TO NEAREST WELL	:	1	10	10	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	3	3	9	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	2	10	20	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	0	6	0	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	3	9	27	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	0	6	0	18
GROUND WATER	:	3	6	18	18
SUBTOTALS				102	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) = 57

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (40)
<FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX>

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A (40) x PERSISTENCE FACTOR (1) = SUBSCORE B (40)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B (40) x PHYSICAL STATE MULTIPLIER (1) = WASTE CHARACTERISTICS SUBSCORE (40)

III. PATHWAY

RATING FACTOR	FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF (100 POINTS FOR DIRECT EVIDENCE) OR (80 POINTS FOR INDIRECT EVIDENCE). IF DIRECT EVIDENCE (100) EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE (80 OR LESS) EXISTS, PROCEED TO B.

(30)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	2	8	16	24
SUBTOTALS				58	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					54

2. FLOODING 0 1 0 3

SUBSCORE (100 x FACTOR SCORE /3) : 0

3. GROUND WATER MIGRATION

DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.

(80)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(57)
WASTE CHARACTERISTICS	(40)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(59)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE	x	WASTE MANAGEMENT PRACTICES FACTOR	x		FINAL SCORE
(59)		(1)		=	59

HAZARD ASSESSMENT RATING FORM

NAME OF SITE: SITE NO. 3 - 5-GALLONS CANS UNDER ANTENNA NO. 1
LOCATION: BETHEL RADIO RELAY STATION, BETHEL ALASKA
DATE OF OPERATION/OCCURRENCE: 1958 TO PRESENT
OWNER/OPERATOR: ALASKA AIR COMMAND
COMMENTS/DESCRIPTION:
RATED BY: HMTC

I. RECEPTORS

RATING FACTOR	FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	0	4	0	12
B. DISTANCE TO NEAREST WELL	1	10	10	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	3	3	9	9
D. DISTANCE TO INSTALLATION BOUNDARY	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	2	10	20	30
F. WATER QUALITY OF NEAREST SURFACE WATER	0	6	0	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	3	9	27	27
H. POPULATION (WITHIN 3 MILES) SERVED BY -				
DOWN STREAM SURFACE WATER	0	6	0	18
GROUND WATER	3	6	18	18
SUBTOTALS			102	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) = 57

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (40)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(40) (1) = (40)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(40) (1) = (40)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF <100 POINTS FOR DIRECT EVIDENCE> OR <80 POINTS FOR INDIRECT EVIDENCE>. IF DIRECT EVIDENCE <100> EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE <80 OR LESS> EXISTS, PROCEED TO B.					
(80)					
B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.					
1. SURFACE WATER MIGRATION					
DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	2	8	16	24
SUBTOTALS				58	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					54
2. FLOODING		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0
3. GROUND WATER MIGRATION					
DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26
C. HIGHEST PATHWAY SUBSCORE					
ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.					
(80)					

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(57)
WASTE CHARACTERISTICS	(40)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(59)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE	x	WASTE MANAGEMENT PRACTICES FACTOR	x		FINAL SCORE
(59)		(1)		=	59

NAME OF SITE: SITE NO. 4 - 55-GALLON DRUM ON EQUIPMENT BUILDING PORCH
LOCATION: BETHEL RADIO RELAY STATION, BETHEL ALASKA
DATE OF OPERATION/OCCURRENCE: 1958 TO PRESENT
OWNER/OPERATOR: ALASKA AIR COMMAND
COMMENTS/DESCRIPTION:
RATED BY: HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	0	4	0	12
B. DISTANCE TO NEAREST WELL	:	1	10	10	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	3	3	9	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	2	10	20	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	0	6	0	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	3	9	27	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	0	6	0	18
GROUND WATER	:	3	6	18	18
SUBTOTALS				102	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) = 57

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (40)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(40) (1) = (40)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(40) (1) = (40)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF <100 POINTS FOR DIRECT EVIDENCE> OR <80 POINTS FOR INDIRECT EVIDENCE>. IF DIRECT EVIDENCE <100> EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE <80 OR LESS> EXISTS, PROCEED TO B.

(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	2	8	16	24
SUBTOTALS				58	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					54

2. FLOODING

		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.

(80)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(57)
WASTE CHARACTERISTICS	(40)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(59)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE	x	WASTE MANAGEMENT PRACTICES FACTOR	x		FINAL SCORE
(59)		(1)		=	59

NAME OF SITE: SITE NO. 5 - DRUMS, CANS, AND CANISTERS AT NORTH END OF EQUIPMENT BLDG.
LOCATION: BETHEL RADIO RELAY STATION, BETHEL ALASKA
DATE OF OPERATION/OCCURRENCE: 1958 TO PRESENT
OWNER/OPERATOR: ALASKA AIR COMMAND
COMMENTS/DESCRIPTION:
RATED BY: HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	0	4	0	12
B. DISTANCE TO NEAREST WELL	:	1	10	10	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	3	3	9	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	2	10	20	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	0	6	0	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	3	9	27	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	0	6	0	18
GROUND WATER	:	3	6	18	18
		SUBTOTALS		102	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) = 57

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (40)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(40) (1) = (40)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(40) (1) = (40)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF (100 POINTS FOR DIRECT EVIDENCE) OR (80 POINTS FOR INDIRECT EVIDENCE). IF DIRECT EVIDENCE (100) EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE (80 OR LESS) EXISTS, PROCEED TO B.

(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	2	8	16	24
SUBTOTALS				58	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					54

2. FLOODING		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.

(80)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(57)
WASTE CHARACTERISTICS	(40)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(59)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE	x	WASTE MANAGEMENT PRACTICES FACTOR	x	FINAL SCORE
(59)		(1)	=	59

HAZARD ASSESSMENT RATING FORM

NAME OF SITE SITE NO. 6 - 55-GALLON DRUMS
LOCATION BETHEL RADIO RELAY STATION, BETHEL ALASKA
DATE OF OPERATION/OCCURRENCE 1958 TO PRESENT
OWNER/OPERATOR ALASKA AIR COMMAND
COMMENTS/DESCRIPTION
RATED BY HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	0	4	0	12
B. DISTANCE TO NEAREST WELL	:	1	10	10	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	3	3	9	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	2	10	20	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	1	6	6	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	3	9	27	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	0	6	0	18
GROUND WATER	:	3	6	18	18
		SUBTOTALS		108	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 60

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (40)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(40)(1) = (40)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(40)(1) = (40)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF (100 POINTS FOR DIRECT EVIDENCE) OR (80 POINTS FOR INDIRECT EVIDENCE). IF DIRECT EVIDENCE (100) EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE (80 OR LESS) EXISTS, PROCEED TO B.

(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	2	8	16	24
SUBTOTALS				58	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					54

2. FLOODING

		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.

(80)

IV. WASTE MANAGEMENT PRACTICES

4. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(60)
WASTE CHARACTERISTICS	(40)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(60)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE	x	WASTE MANAGEMENT PRACTICES FACTOR	x		FINAL SCORE
(60)		(1)		=	60

HAZARD ASSESSMENT RATING FORM

NAME OF SITE: SITE NO. 7 - DUMP AREA ALONG EAST DIRT ROAD
LOCATION: BETHEL RADIO RELAY STATION, BETHEL ALASKA
DATE OF OPERATION/OCCURRENCE: 1952 TO PRESENT
OWNER/OPERATOR: ALASKA AIR COMMAND
COMMENTS/DESCRIPTION:
RATED BY: HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	0	4	0	12
B. DISTANCE TO NEAREST WELL	:	1	10	10	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	3	3	9	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	2	10	20	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	1	6	6	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	3	9	27	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	0	6	0	18
GROUND WATER	:	3	6	18	18
		SUBTOTALS		108	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) = 60

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (40)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(40) (1) = (40)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(40) (1) = (40)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF (100 POINTS FOR DIRECT EVIDENCE) OR (80 POINTS FOR INDIRECT EVIDENCE). IF DIRECT EVIDENCE (100) EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE (80 OR LESS) EXISTS, PROCEED TO B.

(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	2	8	16	24
SUBTOTALS				58	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					54

2. FLOODING

		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.

(80)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(60)
WASTE CHARACTERISTICS	(40)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(60)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE	x	WASTE MANAGEMENT PRACTICES FACTOR	x	FINAL SCORE
(60)		(1)	=	60

HAZARD ASSESSMENT RATING FORM

NAME OF SITE: SITE NO. 6 - PERMAFROST CONDUCTORS
LOCATION: BETHEL RADIO RELAY STATION, BETHEL ALASKA
DATE OF OPERATION/OCCUPRENCE: 1972
OWNER/OPERATOR: ALASKA AIR COMMAND
COMMENTS/DESCRIPTION:
RATED BY: HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	0	4	0	12
B. DISTANCE TO NEAREST WELL	:	1	10	10	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	3	3	9	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	2	10	20	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	1	6	6	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	3	9	27	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	0	6	0	18
GROUND WATER	:	3	6	18	18
		SUBTOTALS		108	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 60

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (40)
<FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX>

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A	x	PERSISTENCE FACTOR		SUBSCORE B
(40)	(	0.8)	=	(32)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B	x	PHYSICAL STATE MULTIPLIER		WASTE CHARACTERISTICS SUBSCORE
(32)	(	1)	=	(32)

III. PATHWAY

RATING FACTOR	FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF (100 POINTS FOR DIRECT EVIDENCE) OR (80 POINTS FOR INDIRECT EVIDENCE). IF DIRECT EVIDENCE (100) EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE (80 OR LESS) EXISTS, PROCEED TO B.

(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	2	8	16	24
SUBTOTALS				58	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					54

2. FLOODING		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.

(80)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(60)
WASTE CHARACTERISTICS	(32)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(57)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE	x	WASTE MANAGEMENT PRACTICES FACTOR	x		FINAL SCORE
(57)		(1)		=	57

HAZARD ASSESSMENT RATING FORM

NAME OF SITE: SITE NO. 9 - DISTURBED LAND
LOCATION: BETHEL RADIO RELAY STATION, BETHEL ALASKA
DATE OF OPERATION/OCCURRENCE: 1978 TO PRESENT--
OWNER/OPERATOR: ALASKA AIR COMMAND
COMMENTS/DESCRIPTION:
RATED BY: HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	0	4	0	12
B. DISTANCE TO NEAREST WELL	:	1	10	10	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	3	3	9	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	2	10	20	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	1	6	6	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	3	9	27	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	0	6	0	18
GROUND WATER	:	3	6	18	18
		SUBTOTALS		108	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) = 60

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (S)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (40)
<FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX>

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(40) (1) = (40)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(40) (1) = (40)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF (100 POINTS FOR DIRECT EVIDENCE) OR (80 POINTS FOR INDIRECT EVIDENCE). IF DIRECT EVIDENCE (100) EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE (80 OR LESS) EXISTS, PROCEED TO B.

(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	2	8	16	24
SUBTOTALS				58	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					54

2. FLOODING

		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.

(30)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(60)
WASTE CHARACTERISTICS	(40)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(60)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE	x	WASTE MANAGEMENT PRACTICES FACTOR	x	FINAL SCORE
(60)		(1)	=	60

APPENDIX E

PHOTOGRAPHS

Photo 1. Bethel RRS-View Looking North, from left to right: Antenna No. 1, Facility Support Bldg., (front), Antenna No. 6 (back), Equipment Bldg, and Antenna No. 5.

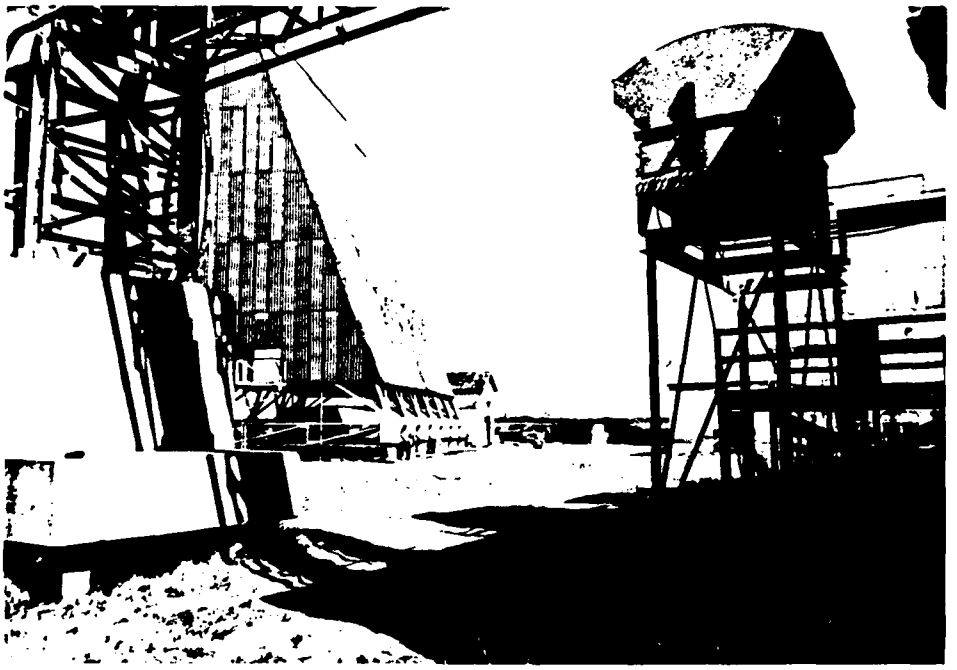

Photo 2. Bethel RRS-View Looking North, Pipe Support Base (foreground), Antenna No. 1 and Vehicle Maintenance Bldg (background).

Photo 3. Site No. 1 - POL Facility - Tank Holders.

Photo 4. Site No. 1 - POL Facility - Pumphouse.

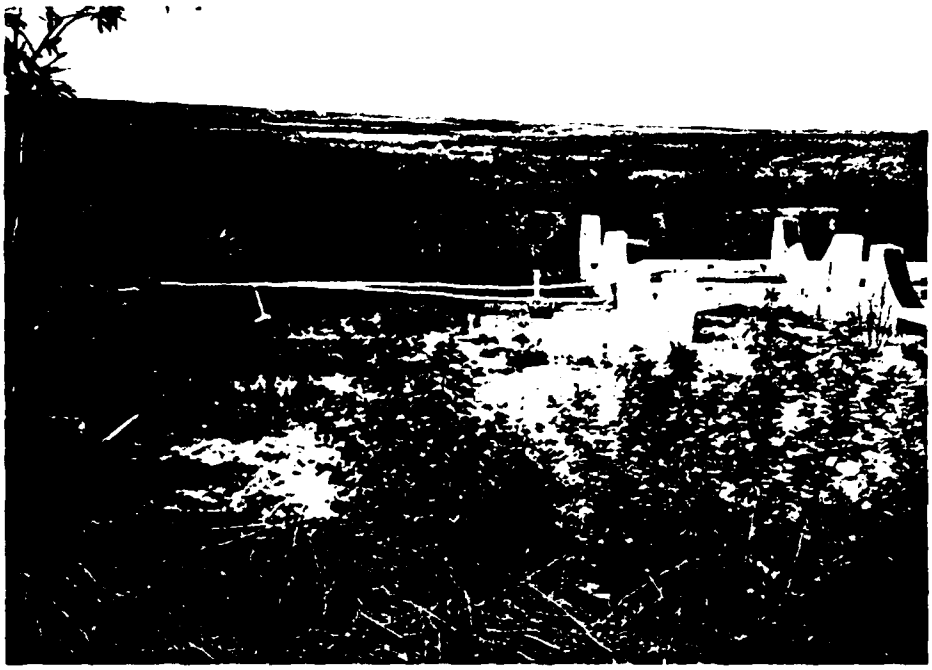

Photo 5. Site No. 1 - POL Facility - Holders and Piping.

Photo 6. Site No. 2 - Vehicle Maintenance Bldg. - Drum and Stained Soil.

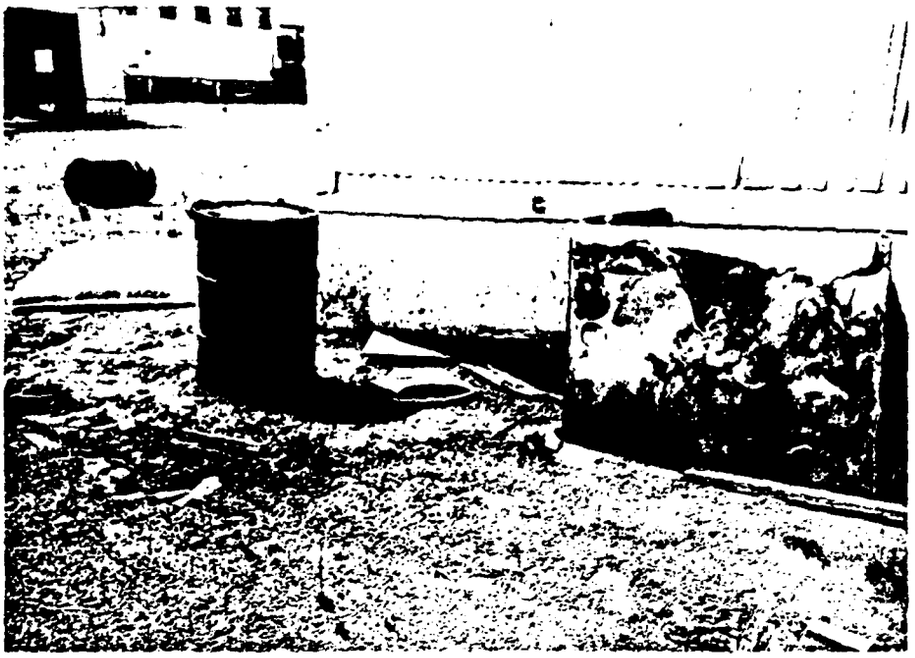

Photo 7. Site No. 2 - Vehicle Maintenance Bldg. - Drum and Stained Soil.

Photo 8. Site No. 2 - Vehicle Maintenance Bldg. - Stained Soil.

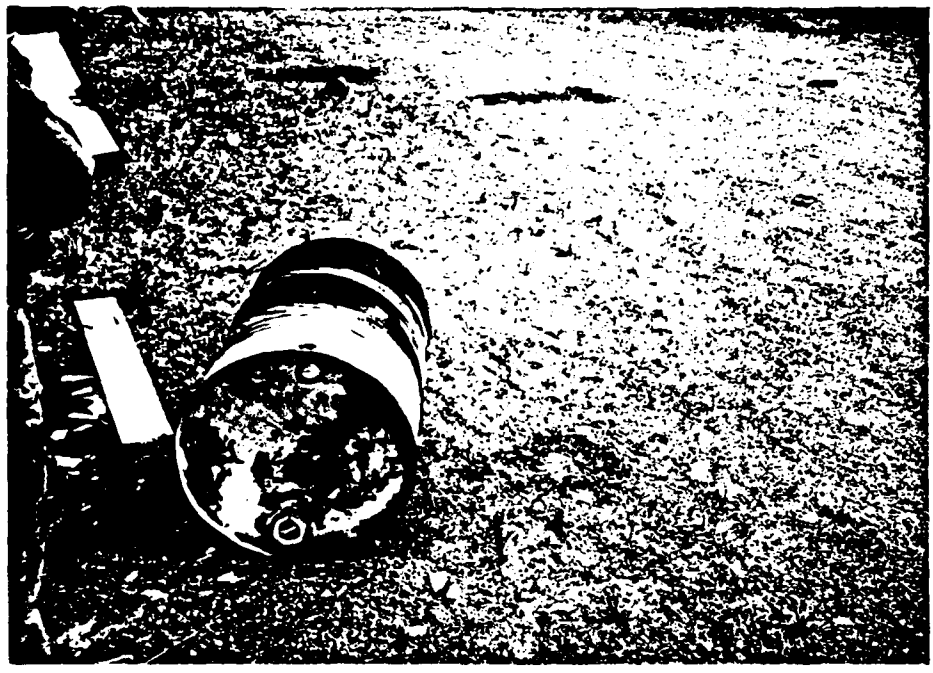

Photo 9. Site No. 2 - Vehicle Maintenance - Drum.

Photo 10. Site No. 2 - Vehicle Maintenance - Front View.

Photo 11. Site No. 2 - Vehicle Maintenance Bldg. - Inside View (back room).

Photo 12. Site No. 2 - Vehicle Maintenance Bldg. - Sludge Drum.

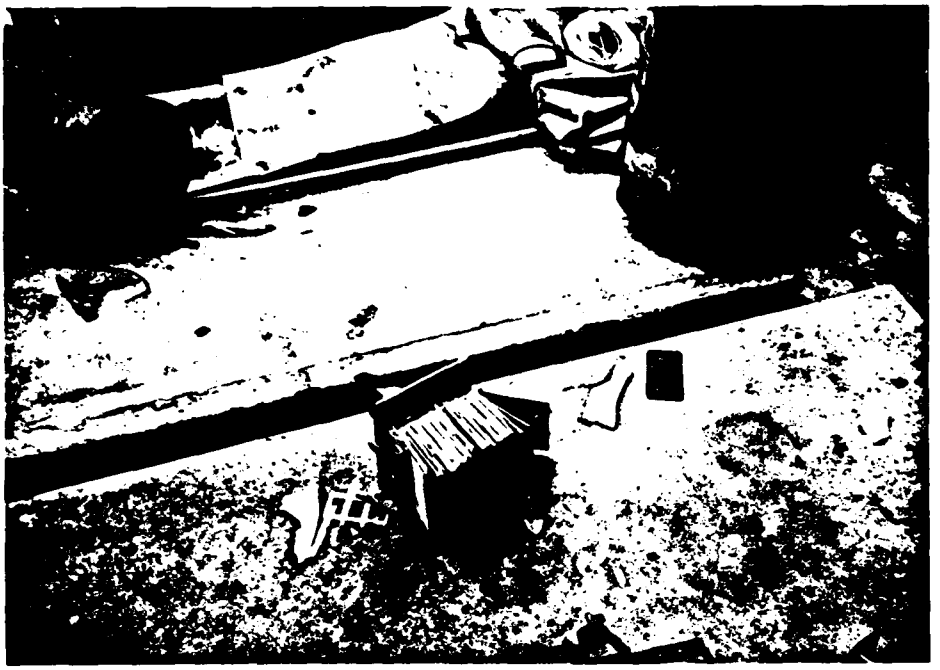

Photo 13. Site No. 2 - Vehicle Maintenance Bldg. - Filter and Debris.

Photo 14. Site No. 2 - Vehicle Maintenance Bldg. - Inside View (front room).

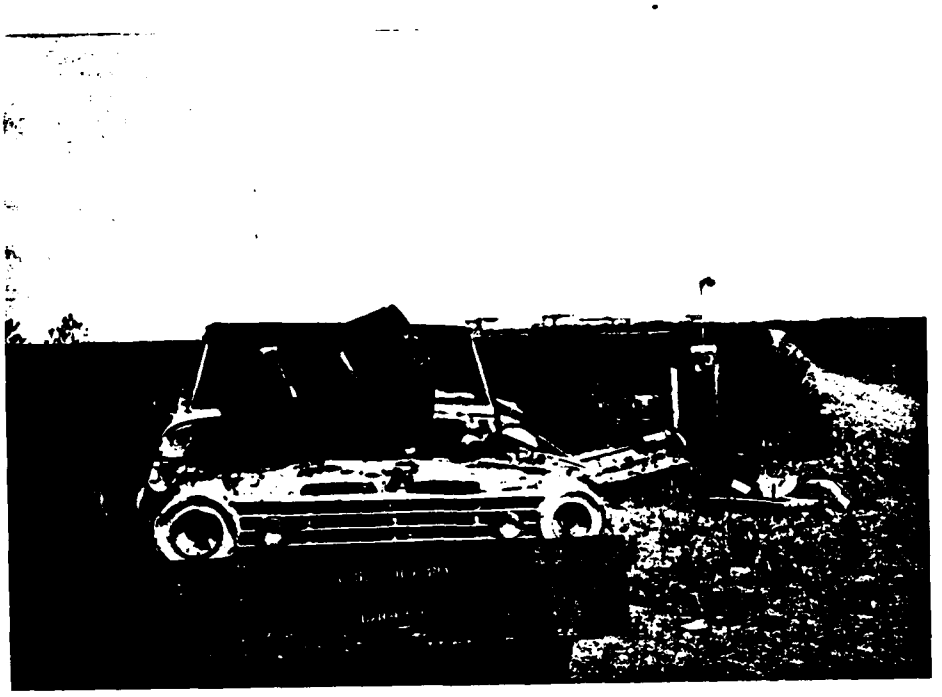

Photo 15. Site No. 2 - Vehicle Maintenance Bldg. - Fuel Pump, Truck and Drum D-9 (label on opposite side).

Photo 16. Site No. 3 - 5-Gallon Cans under Antenna No. 1.

Photo 17. Site No. 4 - 55-Gallon Drum - Side View

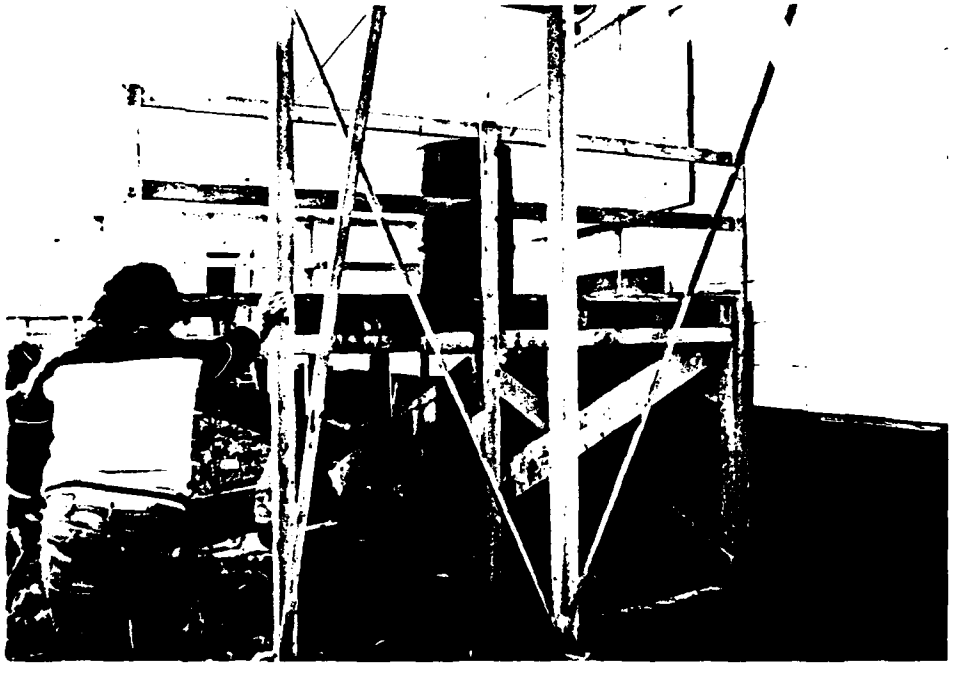

Photo 18. Site No. 4 - 55-Gallon Drum - Front View

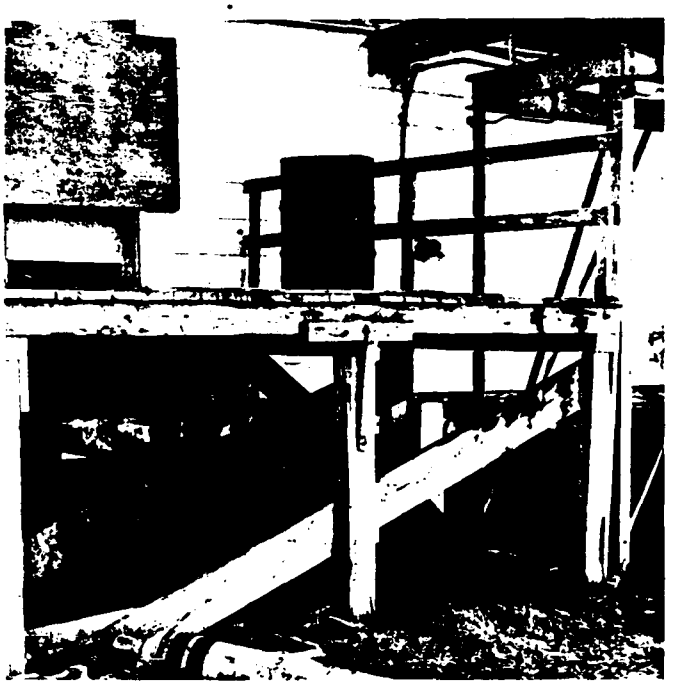

Photo 19. Site No. 4 - 55-Gallon Drum - Closer View.

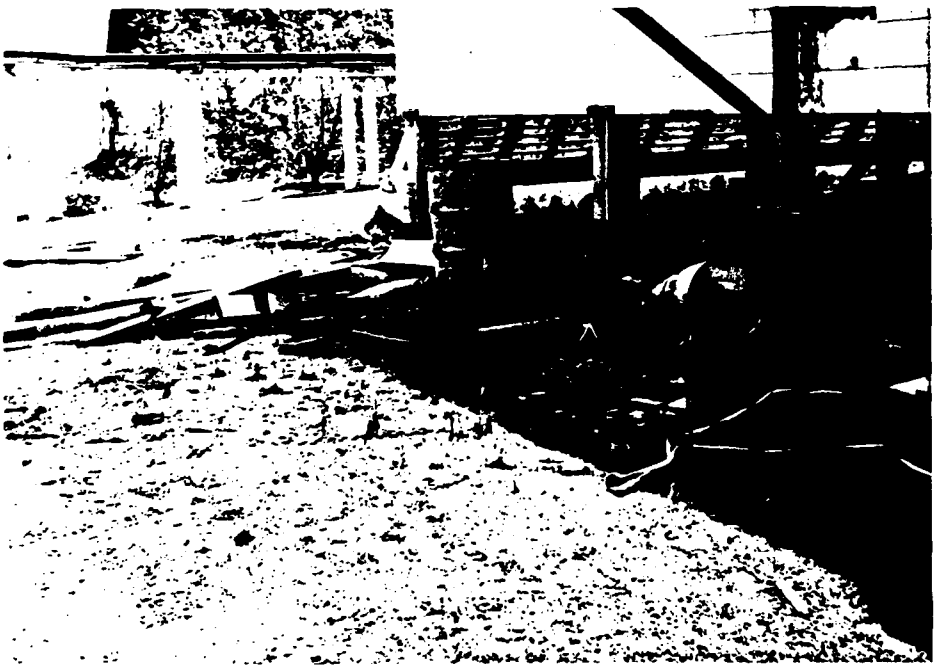

Photo 20. Site No. 5 - Drums, Cans, and Canisters - Side View.

Photo 21. Site No. 5 - Drums, Cans, and Canisters - Top View.

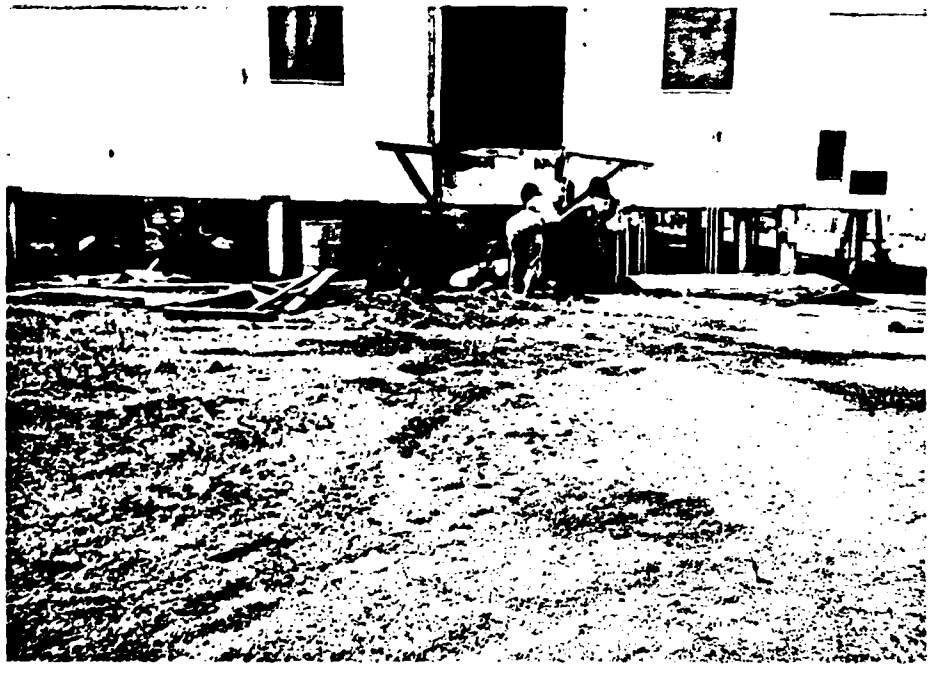

Photo 22. Site No. 5 - Drums, Cans, and Canisters - Contaminant Migration.

Photo 23. Site No. 5 - Drums, Cans, and Canisters - Contaminant Migration (Top View).

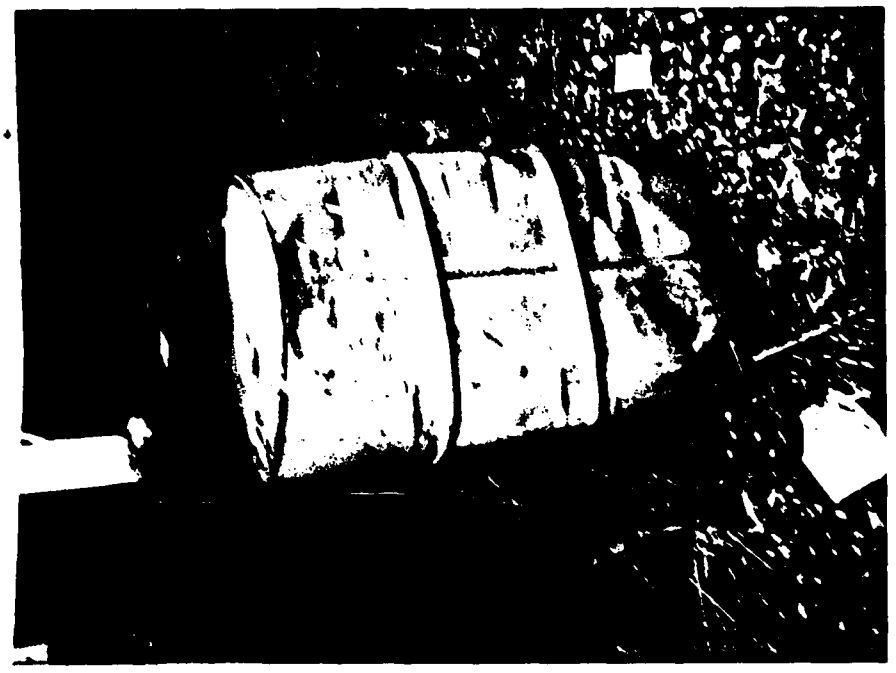

Photo 24. Site No. 5 - Drums, Cans, and Canisters - Numbered Drum.

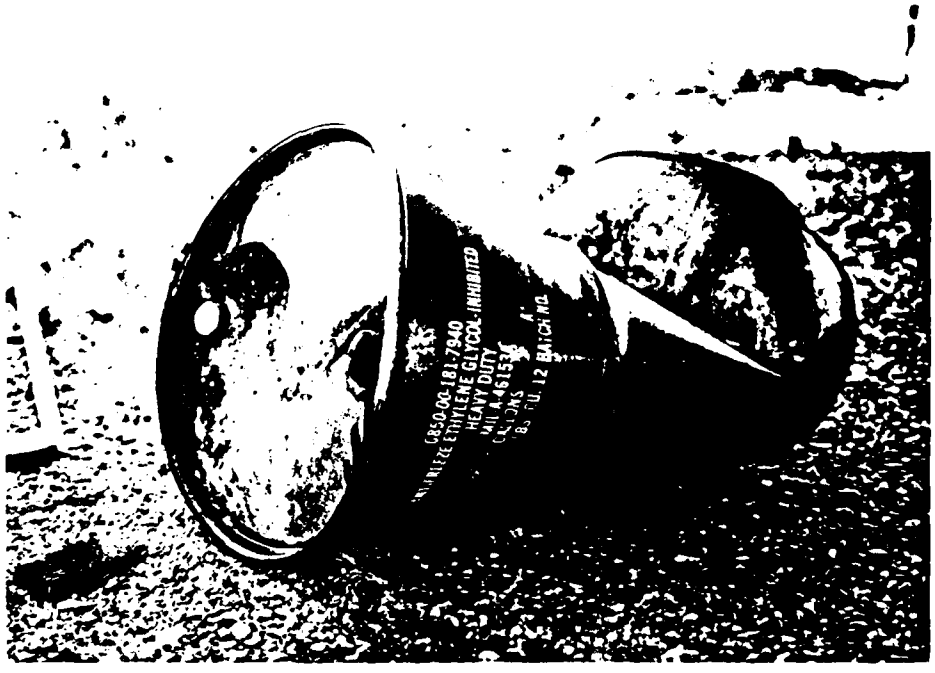

Photo 25. Site No. 5 - Drums, Cans, and Canisters - Empty Ethylene Glycol Drum.

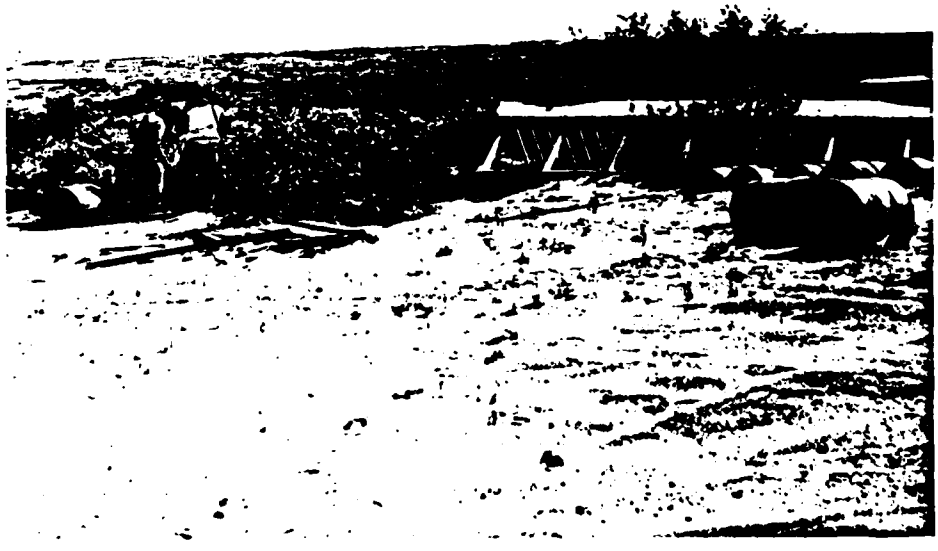

Photo 26. Site No. 6 - Horizontal Drums - Front View.

Photo 27. Site No. 6 - Horizontal Drums - Thick Substance Migration.

Photo 28. Site No. 6 - Horizontal Drums - Thin Substance Migration.

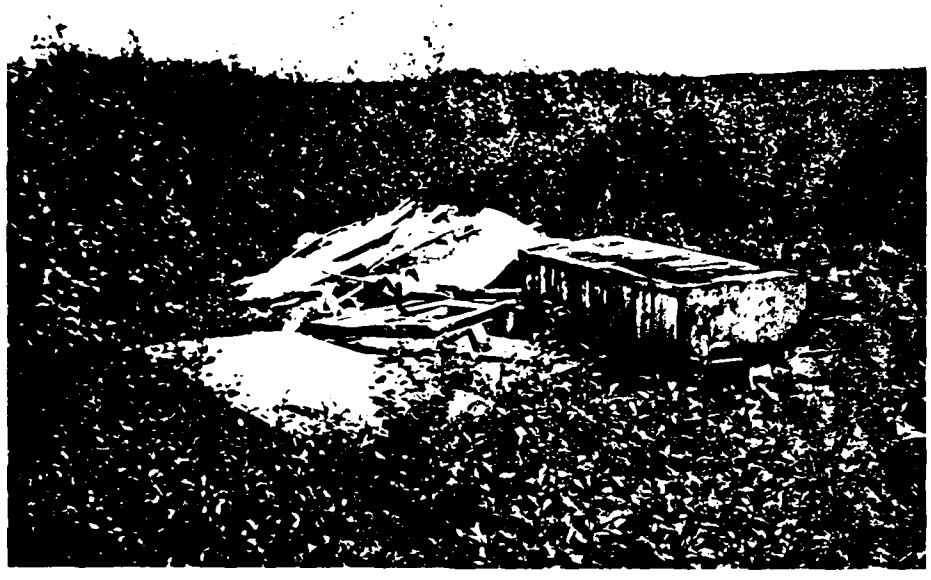

Photo 29. Site No. 7 - Dump Area - Construction Debris.

Photo 30. Site No. 7 - Dump Area - Construction Debris.

Photo 31. Site No. 7 - Dump Area - Drums and Debris.

Photo 32. Site No. 7 - Dump Area - Construction Debris.

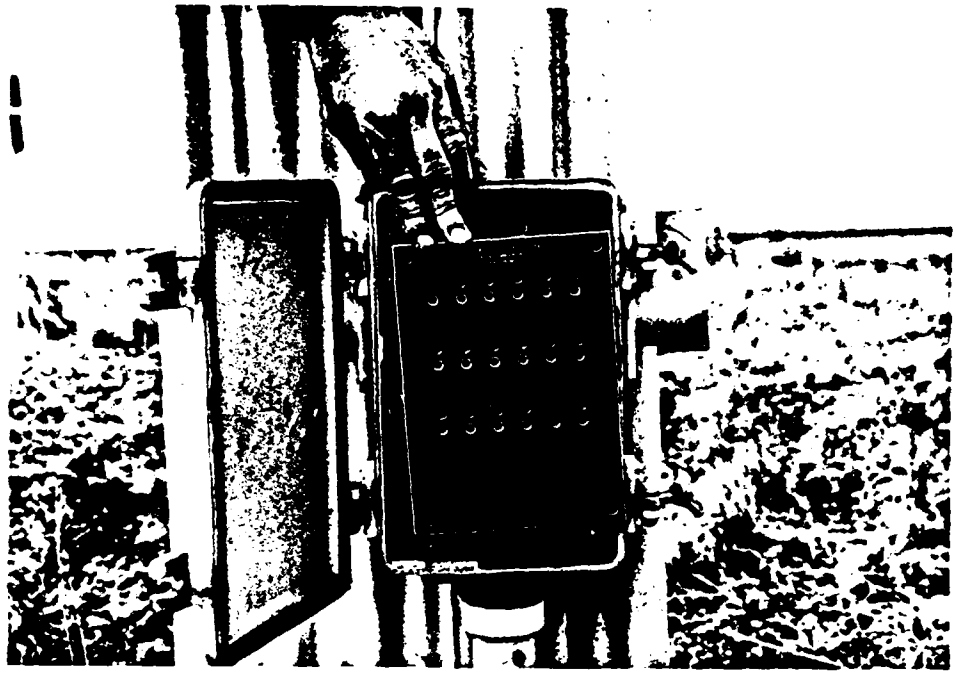

Photo 33. Site No. 8 - Permafrost Conductors - Conductor.

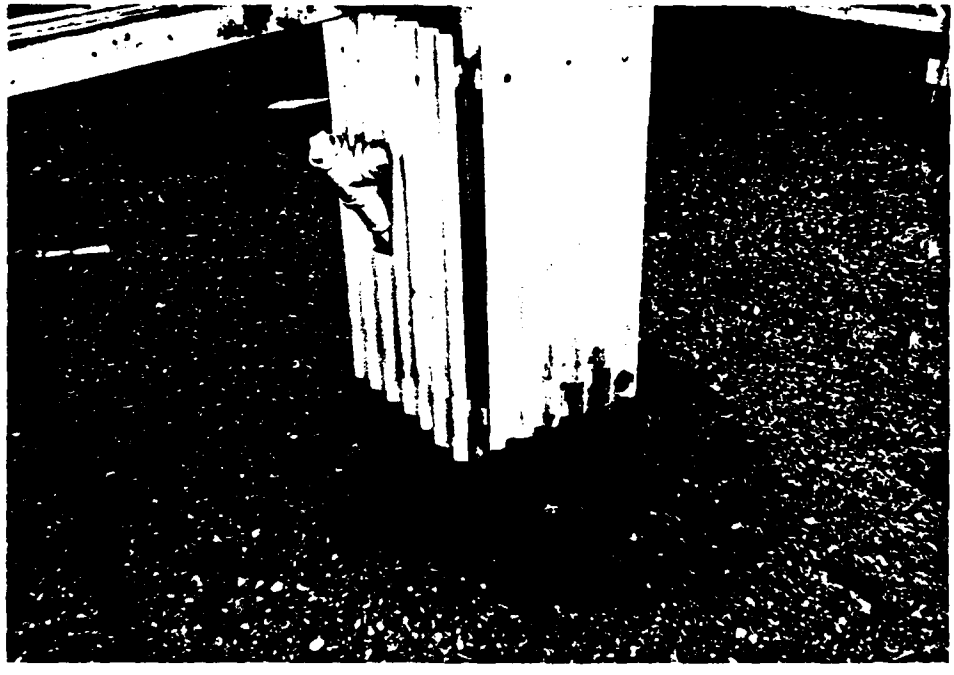

Photo 34. Site No. 8 - Permafrost Conductors - Oil Stain around Leg.

Photo 35. Site No. 9 - Disturbed Land - Looking West.

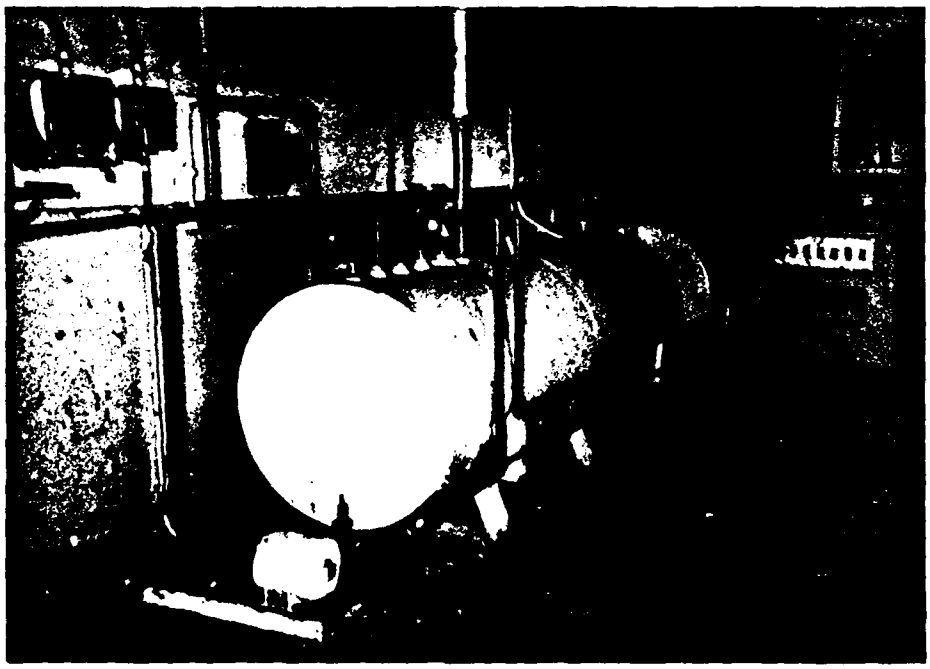

Photo 36. Equipment Bldg. - Fuel Tanks.

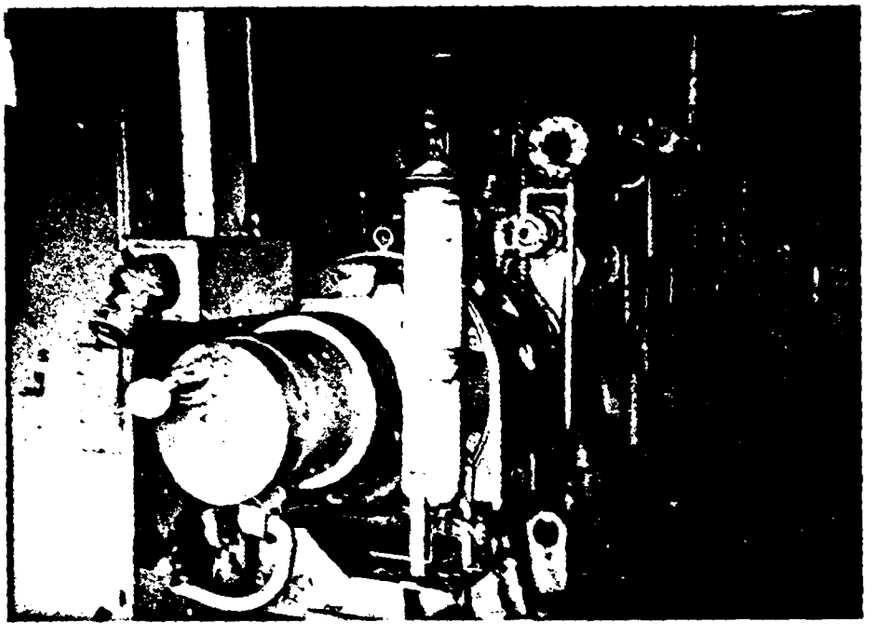

Photo 37. Equipment Bldg. - Generator.

Photo 38. Equipment Bldg. - Batteries.

Photo 39. Equipment Bldg. - Batteries.

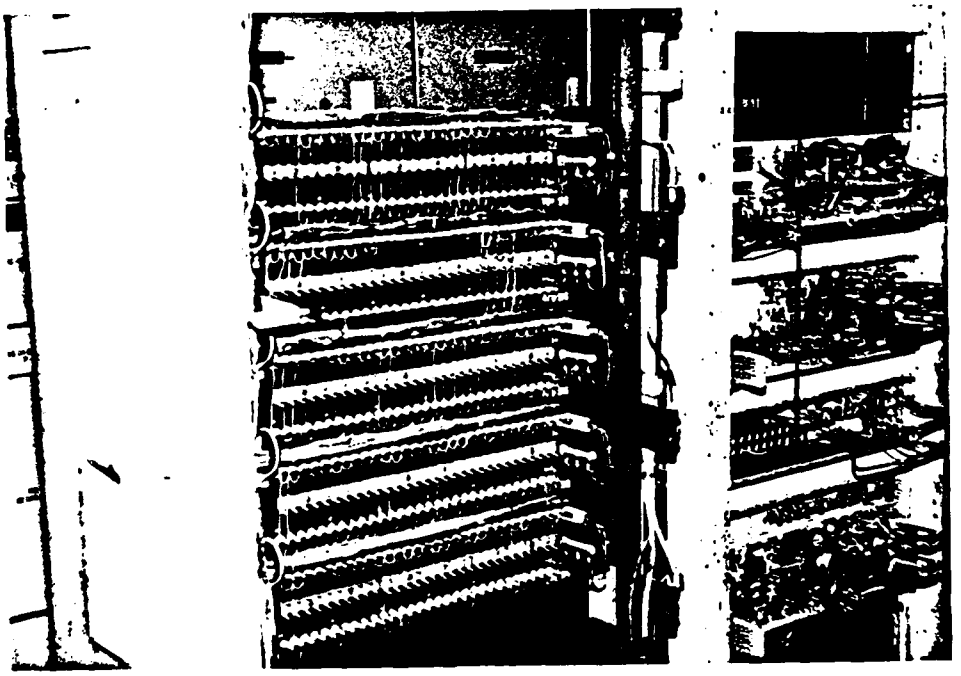

Photo 40. Equipment Bldg. - Communications Equipment.

Photo 41. Support Facility Bldg. - Batteries.

Photo 42. General Debris - North of Antenna No. 2.

Photo 43. General Debris and Stained Soil - West of Support Facility Bldg.

Photo 44. Unidentified Bldg. - East of Main Area.

Photo 45. Landfill Area - 200 Yds. East of Main Area (along East Unpaved Road)

Photo 46. Landfill Area - Close-up of Drum on North Edge of Area.